Designing for Experiences

Case of a Mobile Imaging System

Master's Thesis
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Abstract

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Title:	Designing for Experiences, Case of a Mobile Imaging System
Date:	17.10. 2008
Number of pages:	86
Department:	Medialab
Advisor:	Rasmus Vuori
Keywords:	User experience, interface design

This thesis describes a design process of a mobile imaging service. The service is used as a case example to study how experiences can be designed for.

At first, the research questions are introduced and their relevance is explained in context. As the produced system is team process, personal role in making it is also clarified.

State of the art is then studied. Relevant concepts are introduced to give an overview of the field in general. Few other systems and services operating on the same field are introduced for the sake of comparison.

The design philosophy is then introduced to outline aspects that are likely to have an impact to perceived user experience. Examples are given how the designed system copes to the selected aspects and how the potential negative experiences are minimized.

Finally, the prototype implementation of the system was evaluated in multiple user tests. The tests showed general acceptance in multiple levels of the process as wells as indicated issues with the design that need to be improved upon in the future. More importantly, the test results show correlation with design aims, thus increasing the confidence that experiences can, to some extent, be designed for.

Tiivistelmä

Tekijä:	Janne Kaasalainen
Työn nimi:	Designing for Experiences, Case of a Mobile Imaging System
Päivämäärä:	17.10. 2008
Kokonaissivumäärä:	86
Osasto:	Medialab
Työn ohjaaja:	Rasmus Vuori
Avainsanat:	käyttökokemus, käyttöliittymäsuunnittelu

Tämä lopputyö kuvailee erään kuvapalvelun suunnitteluprosessia. Palvelua käytetään esimerkkinä kuinka suunnittelua voidaan tehdä käyttökokemusta varten.

Työ alkaa esittelemällä tutimuskysymykset ja syyt niiden valitsemiseen. Koska tuotettu palvelu on ryhmätyö, myös henkikohtainen roolini eritellään sen tekemisessä.

Työn kannalta oleelliset käsitteet esitellään antamaan yleiskuva työn aihealueesta ja muista siihen liittyvistä tutkimuksista. Muita aihealueella vaikuttavia palveluita ja systeemejä käydään myös läpi vertailun vuoksi.

Käyttökokemukseen liittyviä piirteitä käydään läpi havainnollistamaan suunnittelufilosofian erityispiirteitä ja kuinka esitelty palvelu huomioi näihin liittyvää problematiikkaa muun muassa minimoidakseen huonojen kokemusten todennäköisyyksiä.

Lopuksi tuotettua palvelukonseptin arviointia käydään läpi useiden käytettävyystestien kautta. Testit paljastivat konseptin yleisen hväksyttävyyden, mutta paljastivat myös ongelmakohtia. Huomionarvoista on, että tulokset korreloivat suunnittelutavoitteiden kanssa, antaen uskoa että käyttäjäkokemuksia varten suunniteleminen on mahdollista tiettyihinn rajoihin asti.

Foreword

It took only a few months before I found a proper chance to work on this thesis after the first one for Helsinki University of Technology. In the earlier thesis I studied the user experience and interface design in podcast client and this time I was fortunate enough to apply the lessons learnt to this thesis and go more deeply into the design evaluation itself.

Two masters theses were a chore. Thus my thanks go to people who have helped me on my journey so far – my parents, naturally, who have let me have a wide area of interests and have given the opportunity to explore. To Tuomas Tammi, who encouraged me to undertake this task and pushed me with deadlines without which nothing would get done. And finally my thanks go to Hanna Bragge for her continuous support.

Great many thanks also go to my instructors Rasmus Vuori for getting this thesis both started and finished. It should not be forgotten that this thesis is also based on teamwork by a group that is among the best I've ever had a chance to work with thus far. Many thanks go to them for making this work possible in the first place.

Helsinki, 17.10. 2008

Janne Kaasalainen

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1. Introduction

"Kind to chips, cruel to people" – Bill Moggridge

1.1. Background to eXposure imaging service

The work for what was to be called eXposure started late in 2006 as a result of forming a new team to research and study Internet consumer services. Emphasis for the project was not on technology, but to study what kind of services could be created and what sort of new concepts might appear in the future.

As one sub-project area, imaging was found as a promising area due to both assumed and observed usage patterns. As shown in figure 1, this assumption was later confirmed by internal study. Imaging, especially the camera, is among the most used applications on Nokia N95 and thus would assumedly have better chances of gaining users. Furthermore, the imaging area has not been explored thoroughly.

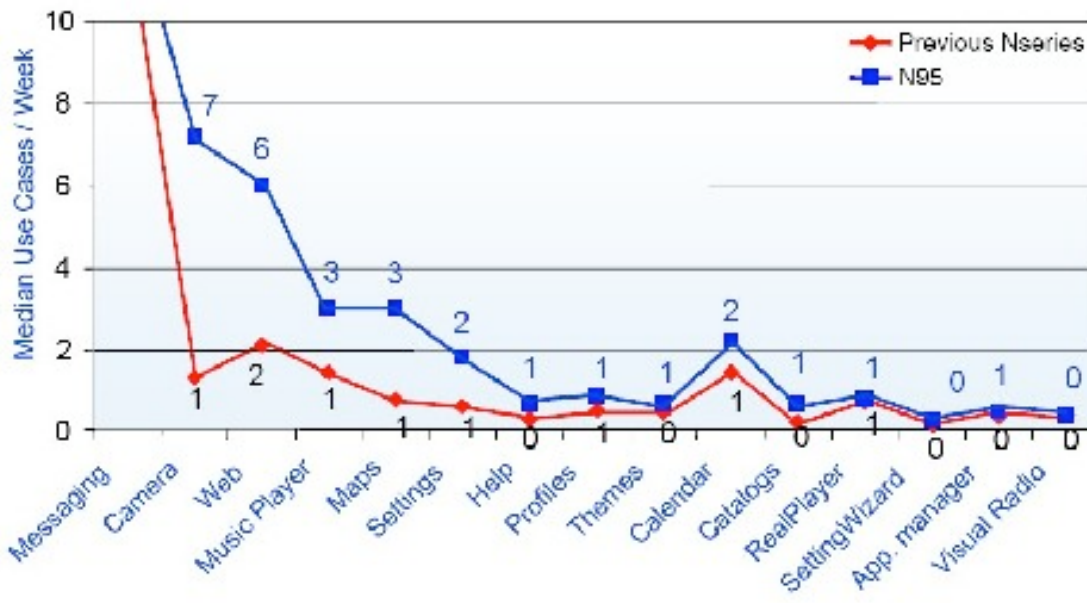

Figure 1. Usage pattern for some applications comparing general Nseries to N95. The counts present the average times the applications were used during a week. Internal study.

As the project was about working in the consumer domain and expected genuine interest from potential users, the importance of user experience and the research dealing with the topic was emphasised from early on. As the topic is relatively new and still forming its shape among Human-Computer-Interaction interest groups, this thesis tries to reflect on the practical side of designing experiences in the consumer electronics domain.

Additionally this thesis is a continuation of previous projects in which the concepts of pleasure, usability and enjoyment have been studied and thus, tries to gain further understanding of what constitutes user experience. How human aspects such as joy and pleasure can be taken into account at a practical design level before actual solutions exist.

1.2. Research Questions

1.2.1. Motivation

The systems we, as designers, build each day increase in complexity as the technology advances and as our own needs develop. They increasingly start to be parts of our daily life in more or less visible roles. They are

expected to do more for us and at the same time concentrate on what we are doing and provide us a way to enjoy the time we have on our hands.

The life cycle of technology begins with an invention. In some cases this invention makes it possible to do things that weren't doable before. When this happens, the new opportunities that arised are infinitely better compared to the past. The user is empowered to do the impossible, even if it may not be usable nor even a nice experience for them. Thus, a solution that allows people do what they could not before is a valid strategy when that something is valuable enough to justify the immaturity of the solution. It can, of course, come with the price of lost users who do not manage to take the invention into use.

When the technology matures, the attention starts to shift to softer values. It is no longer enough to provide solutions that only work in technical sense of the word. Once the solution starts to have competition that also allows the user to do the same things, different, previously latent, needs start to emerge. These solutions first need to be usable, so that the people do not need to see great effort to learn and continue their usage. Once this is achieved, the race continues to provide the holistic experience to captivate the user and potential buyer.

It is at this stage when the questions about this holistic experience start to pop up. The rules change the second time – the first being the transition being able to do what one wanted and improving by doing it more easily. Now the user starts to take even more crucial role, as the application is no longer good enough unless it satisfies the hedonistic side of the user as well. But can we really design experiences and what does experience design really mean from practical point of view?

This work describes my attempts to explore this field by producing an image gallery application that aims to be as pleasant to use as possible and test hypothesizes about how to create pleasurable products. This exercise is done for consumer space in mind and thusly attempts to fill the desires of good portion of the mass market.

1.2.2. Can We Design Experiences?

Before going deep into questions of how to design experiences, it could be questioned if experience design is possible in the first place? The question is surely more complex than what it might appear at first.

The simple answer could be that it is not. It could be said that user experience is ultimately a feeling that is affected by expectations and person's history, opinions and values to name a few parameters (Roto

2006). These expectations could be played with marketing, branding and various other means, however.

The expectations are, hopefully, followed by the actual usage. This too is a complex matter - not only can this to be divided to the ability to learn and to aspects of continuous use, but it can also be affected by the context where and when the system is being used.

And lastly there is reflection period, when the user either consciously or unconsciously evaluates how the experience the product offered him really was. How it feels a week later – do users long to use the system again or do they hate it from the bottom of their hearts. From these experiences they forms new expectations, whether towards the same product or towards a new one (Mäkelä & Suri, 2001).

Thus, it could be argued that we cannot design holistic experiences.

It could also be argued that experience design is possible. There are movies, art and exhibitions, which seem to try to convey emotions, moods and feelings. Rarely does a comedy not laugh, or a tragedy avoids sadness. We have companies that are widely appreciated for their user experience offerings. I would be hard-pressed to argue that this is a coincidence. For if it is, how can some succeed in this time and time again?

So, perhaps we can design experiences.

It might not be impossible to include the example cases of one view to the argumentation for the other. Thus this thesis tries to explore the grey area in between these two opposing points of view and find some answers to the question “how to design for experiences”?

This thesis takes a practical approach to the question and tries to set up basic assumptions, which are applied into software and service design. The results are then evaluated in user tests to see if the solution was received positively.

1.3. Team Work and Personal Role

1.3.1. Field of User Experience

The domain in which many user experience professionals operate is vast and there are no single list of tasks that people who consider operating with reasonably close issues would subscribe to. In fact, it is not even

clear cut what, or who, can be considered user experienced related activity.

To illustrate this point, let's consider someone working on algorithmic design and this person happens to make a specific algorithm 30% faster than what was before. Additionally, this piece of code is used on many occasions on a slow device. As a result, many operations and the speed of use of the device is improved 20%. This amount of increase is phenomenal, and it could easily be argued that the results to overall user experience are far greater than fine-tuning the graphical looks of the device.

Another example would be the field of haptics. The basic research on improving input and output quality is again likely to affect the user experience if an alteration to what there was before occurs. This is not what is meant by user experience or experience design albeit this starts to be in the grey area and could be argued each way.

In fact, by the very nature of user experience, the domain it belongs covers most if not all activities that relate to the particular system in question. For practical reasons not all of these activities are regarded as experience design, however, for the sheer sake of what is possible to manage and to retain some level of understanding what is meant by being an "experience designer". Thus, figure 2 lists a few, broad level topics that can, and are, aspects that contribute directly to the experience design. In fact, the division of the list elements is rather similar to human centred design practices for interactive systems (ISO 13407).

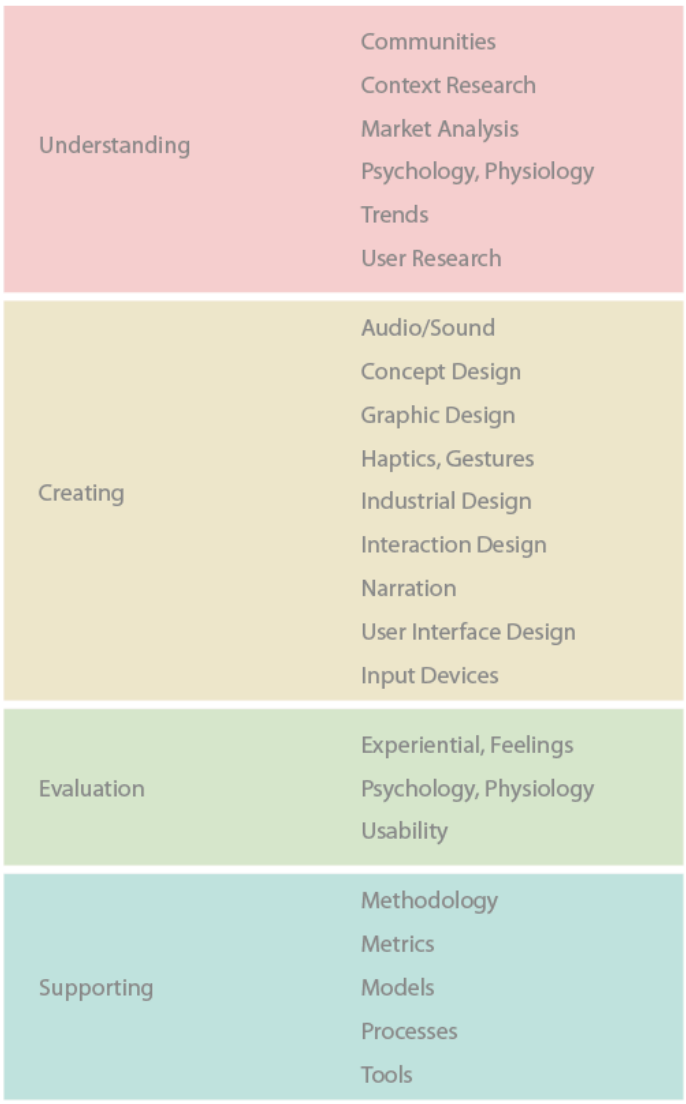

Figure 2. People dealing with user experience related issues operate on multiple domains. The image shows an example classification on what areas people are, or should be, working on.

This thesis will not define clear borders who or what is considered to be to user experience per se, but instead takes the viewpoint of an interactive system designer. Such a person is responsible for much of the creation part shown the figure 2. To accomplish a proper design does, however, need for collaboration is evident.

By listing different activities under various categories also highlights the diversity and the skill sets needed. While it is undoubtedly possible to design in isolation, a designer is still likely to make innate decisions on the topics mentioned based on his experiences and understanding of the world. It could be argued that the more in touch the designer is with the people and the world he is designing for, the likely the design is to be successful. Thus, striving to create the best possible systems easily leads

to the practical need of having design teams consisting of experts that cover varying fields.

1.3.2. Integrated Separation

In theory, it would seem plausible to be able to grow teams to include experts from all the related fields that the system in question is touching. This might seem especially appealing were there no resource issues. However, a personal observation has shown examples where this approach has failed to produce wished results.

The issues that arise in large teams are not all too different than those outlined in "The Mythical Man-Month" by Fred Brooks (Brooks 1995). While the main theme of the book is that adding manpower late in the project makes the project finish even later, Brooks also outlines other contributing reasons such as increased complexity in communication, which directly applies to design teams as well. Furthermore, some have even outright encouraged against large teams and instead operate in teams of size 10%-25% of what would be considered a "normal system" and the practice of cutting down the formal documentation, assuming that the people were considered good and possibly meant to be above average in their skills (Clarence 1943). However, the exact reasons for Clarice's rules were not fully explained and given the nature of Lockheed Martin's Skunk Works it should be considered as a mere grain of salt.

As such, I'd wish to highlight that with these examples I do not argue that design and development should be done in large or very small teams, but in teams that are no larger than what is needed. Such line is naturally hazy and depends on too many factors to be accordingly formulated. However, due to both practicalities such as those mentioned above and other necessities, the development team of eXposure was relatively small.

The team producing the imaging application consisted of eight team members, including the team leader in managerial position. Of the remaining seven persons six took part in actual implementation of the prototype and three took active part in the design personnel. Thusly, two out of three main designers had double roles due to their particular skill sets and backgrounds.

Elina Vartiainen took care of the mobile user interface engineering and implementation in addition to taking part in the actual concept design. Furthermore, she was the main responsible for organized and planning user studies both in both pre- and post-concepting phases given her human-computer-interaction (HCI) background. The third person in the design team in addition to the author was Toni Strandell. He

implemented the web user interface alongside taking part to the concept and system design. Both of them handled much of the communication between the rest of the team doing lower level work such as planning the system architecture.

Thus, the design team integrated three separate areas of expertise and brought them together to brainstorm and create high-level ideas. Between these kind of iterative planning sessions, the team members were separated to focus on their own responsibility areas.

1.3.3. Personal Role

My personal role in development of eXposure was that of an interaction designer responsible for the overall user experience. This work started as concept development work to craft what the application should do, who the targeted audience were, to study how imaging services and applications are commonly used and what social factors play important roles.

As the project progressed, the responsibilities shifted more towards interaction design and thus describing how the system should work, what it should do and how as well as trying to communicate the intended mood and behaviour to make it pleasing and enjoyable to use. This was, to great extent, accomplished by creating interface mock-ups and behavioural demonstrations with animation tools. Concrete examples of this will follow in later chapters.

It should also be noted that while this paper may give impression that the roles and responsibilities were clear cut, the outcome is result from team work of multiple people. Not only do many of the ideas originate from the persons outside the design team, many members have shared their views and insights to comment and improve those of others.

1.3.4. Previous Work

Design of eXposure imaging service and the mobile client is a continuation of previous projects that have dealt with usability and user experience aspects in different domains. While lessons can be traced back to rather different projects such as computer game titled "*Snowman In Hell*" (Natunen, Junnila, Kaasalainen, Bastamow, Scheible 2006), this section concentrates to more similar, and newer, projects.

Of these, the first notable project was the user interface design of a podcast application (Kaasalainen, 2007). In this work I studied the role of

pleasure versus the functionality in context of a podcasting application. Special attention was also put on the information that was considered to be relevant to the users. The produced prototype was evaluated in laboratory tests and found more compelling than a commercial competitor. As the work describes both usability and user experience in more detail, both of the concepts are only to be mentioned briefly in this thesis.

In the mean time, I engaged in a small project in which my role was to organize the interface hierarchy and look for a better user experience. Contact Browser Plug-in let people utilize their mobile phones with web browsers by, as an example, directly calling to phone numbers that appeared on the given web page. It further made it possible to add contacts and send SMS (Short Message Service) messages (Tammi, Strandell, Wikman, Kaasalainen 2006).

Finally, during 2005 and 2006 the team I was part of continued to develop the S60 Browser with the emphasis on matters such as handling multiple windows. Again the emphasis was on usability and user experience and our work tried to make the interface of the history list more functional and intuitive. Such was accomplished by taking advantage of animation possibilities and 3D acceleration features found on modern hardware to visualise complex information (Vartiainen, Roto & Kaasalainen, 2008).

2. State of the Art

"When people say 'intuitive', they really mean 'familiar'" – Jef Raskin.

2.1. Usability

The Basis for human computer interaction (HCI) lies greatly on the concept of usability. Luckily, HCI has been a rather well established field and the definition of usability is an ISO standard (ISO 9241-11):

> *"[Usability refers to] the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use."*

However, it has also been noted that usability, while containing the term satisfaction, has not traditionally been concerned with pleasure and joy (Hassenzahl 2001 [2]). This may have been caused by the history of system design and the emphasis on industrial applications. Traditionally usability has been functional and goal centric (Hassenzahl 2001 [1]).

Mark Hassenzahl has argued (Hassenzahl 2003) that the appeal of a system consists of pragmatic and hedonistic values. An interactive system is often trying to fulfil a pragmatic need; such as, in an extreme case, a hammer that is used to put nails into walls. But besides these pragmatic

values there are hedonistic needs as well, including self-expression, social status and enjoyment.

Due to these issues the term “user experience” has been both proposed and used, even if without a precise definition. It tries to better encompass factors such as pleasure and satisfaction and to understand what makes certain systems more appealing than others.

2.2. User Experience and Experience

In regards to terminology, this thesis uses the definition for user experience proposed by Virpi Roto (Roto, 2006). In her doctoral thesis she argues that the term “user experience” would be narrowed down to mean the interaction between the person and a machine. This view is also supported by the following definition:

> *“Every aspect of the user's interaction with a product, service, or company that makes up the user's perceptions of the whole. User experience design as a discipline is concerned with all the elements that together make up that interface, including layout, visual design, text, brand, sound, and interaction. UE (user experience) works to coordinate these elements to allow for the best possible interaction by users.” - (UPA 2007)*

However, experiences, including user experience, consist of previous experiences and expectations that the user has towards the system he is going to use. The user has a motivation to use the new system and he makes an action by using it in a context (to be understood rather vaguely, as “on lunch break” for example or “finding commuting routes”). Motivation, action and context form the present experience at the time of the use. The present experience then moulds the future experiences and the expectations (Mäkelä & Suri, 2001).

An issue with the definitions above is that their abstraction level is relatively high. They are also insufficient for designers to offer more practical help to do their work even if they can be used to provide a mental model that itself can be used as an aid.

Thusly, the term “experience” is used throughout this thesis to cover aspects that are beyond interface and device design and should be considered as a separate term from “user experience”. These aspects include, but are not limited to, marketing, brands, social interaction as well as the eventual departure from using the product. Perhaps the largest difference according to Roto is the difference of user activity;

whereas user experience is limited to the domain where user himself acts with the system. The term experience allows the user be a passive participant (Roto 2006). It is this passivity that allows more methods to, for example, shape the expectations towards the system. A traditional movie would cause an "experience" whereas an interactive movie would be considered to create a "user experience".

2.3. Designing for Experience

It has also been suggested that we ought not to ask if we can design experiences but instead if we can design for experiences. The difference is subtle but philosophically meaningful; designing for experiences does not design experiences themselves but gives them opportunities to emerge (Hassenzahl, 2008). This terminology would allow the experience to be personal and subjective to emphasise that it includes users personal aspects, such as his personal history and previous experiences.

This difference, however, seems to have little or no practical difference to the practical design work itself. It seems unlikely that practical design work would be much different if a solution for a problem would be though as "I hope this will create a fun moment" versus "I do this as I hope it to be fun". Not much experience is needed to notice that the feelings and the emotions of users cannot be universally guaranteed and it seems unlikely that many designers would imagine this was the case. What is likely to be meant in both the cases lies among the lines "I hope that this feature will be found fun by sufficiently large portion of our targeted audience." This requires more understanding of the target audience than the meaning of the word *for*.

2.4. User-Centred Design

A term that is often raised in design related discussions is user-centred design. The Usability Professionals Association defines this as:

> *"User-centered design (UCD) is an approach to design that grounds the process in information about the people who will use the product. UCD processes focus on users through the planning, design and development of a product." – (UPA 2008)*

Typically this has been seen as an iterative, circular process as shown in Figure 3. While exact terms may change depending on the source, the

process is typically started by researching the context in which the eventual product is to be used. This is followed by design and requirement specification, prototyping and evaluations of the produced outcome. The whole procedure can be then started again to refine the product, and similar processes can be used within each iteration phase.

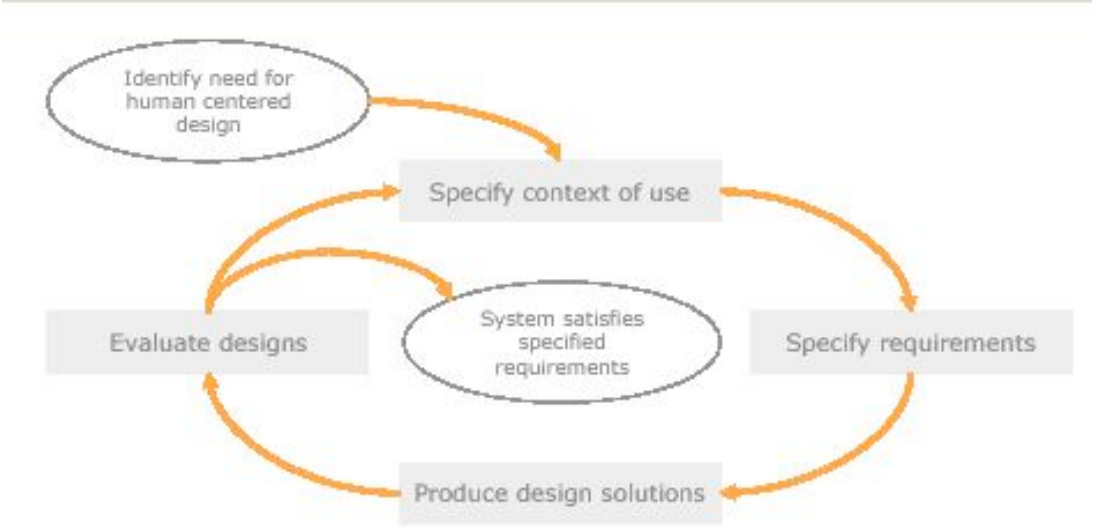

Figure 3. User-Centered Design process. Image courtesy of Usability Professionals' Association.

The user-centred design methodology has many good and valuable concepts. Perhaps the most important lesson is to put the emphasis to the needs of users of the systems being designed for and the value of iteration and testing with the target audience. As a philosophy it is neither right nor wrong, but it does not take away the responsibility from the design team to adapt it to their needs and practices and not needlessly restrict them to one way of working.

The initial start of this iterative cycle remains one of the issues but much of the other criticism towards user-centred design is not actually the fault of the design philosophy itself but that the rigorous adherence towards it without independent thought. This kind of behaviour is typically seen in communities that have strong backgrounds in process driven work practices. We also run into issues while designing systems that do not have a well-established, existing context of use. Additionally, a difference comes from the aspiration towards great systems that stand out from the rest, not simply wishes to produce good systems or ones which aim to avoid failure. While established methodologies seem to do well raising the basic quality of the work, it can be questioned if they are the best solutions for creating outstanding work on their own.

To illustrate this problem, lets imagine that we have managed to create a methodology that consistently produces outstanding results in five easy

steps. Any mediocre level design team is also able to easily follow this methodology. Since we assume that the great success is the result of the process and not just the people involved, it is also fair to assume that the skills of the people do not matter a great deal or that good people are easily found and utilised.

Thus it follows that any company on any given field is able to reproduce the great results. As failing to produce a great result is now a competitive disadvantage, it is fair to say that eventually the market space is filled with equally great products. It also follows that no one can be better than others as long as their market segments are overlapping, or otherwise they would have failed to follow methodology. Failing to follow the methodology is in contradiction to the basic premises that every team can use it and that it is easy or trivial to follow.

I find it unlikely that there would be a situation where competing products would be equally good, at the same time and for a prolonged time. Further, if there is no contrast between the products, being good or bad loses meaning since we would have nothing to compare good and bad to. While it is not possible to say that situation such as the described one could not happen, it does seem rather implausible.

If this conclusion is found acceptable, it follows that no methodology on its own can guarantee great successes and leading products or systems. Competitors would quickly copy any such attempt, given that all they would need to do is to apply a well-known, easy methodology that almost anybody can utilise. From this it also follows that methodologies are no substitute for a talented team.

Another mind game to illustrate the fallacy of relying on methods is the complexity of the world around us. If we would be able to know the exact rules on which the world operates, the initial state from which all began and the involved variables, having an infinitely powerful computer would allow us to actually calculate which design was best suited for future audiences and generate the best possible results. For now, I call this machine “Ultimate Life-Calculation Machine”, as it would need to know or at least be able to deduce everything.

Such machine is, actually, a pre-requisite for any methodology that is claimed to be universal and consists of pre-determined steps that can be used by whichever team of designers. This is because the pre-determined steps need to result in determined and correct answers. These steps in turn depend on the state of the world and the information needs to be pulled from the world accurately.

A larger scale design project often depends on multiple aspects of and many unknown factors. Producing anything takes time, so assumptions need to be made about the future. Assumptions of the current user

behaviour and target group need to be analysed and projected ahead to the point where the system is assumed to be in use. As the number of different affecting variables increases, the Ultimate Life-Calculation Machine becomes a necessity to feed correct data into the design methodology. Human interpretation cannot be allowed, as that would indicate that the method is, in fact, relying on people working on the project and interpreting the information to their best abilities. If it is accepted that the people are affecting the outcome of the project, it follows that it ought to be more beneficial to find people to help you that know what they are doing rather than to adopt methodology if it is desired to create better than average products with relatively short timeframe.

This chapter, by no means, is meant to say that methodologies such as those presented by user-centred design are bad or obsolete. Many methodologies have their root in observing the practices that have worked on earlier projects. It is also worth noting that even having the right people alone does not guarantee positive outcomes. For example, Apple had the key people contributing to its success of iMac in-house from 1993 to 1997 (Buxton, 2008 [2]). Thusly, it would seem preferable to have some understanding of working practices and methodologies together with having a team of skilled people.

Similar thoughts have also been raised in regards to usability testing, with reasoning close to what was presented above. Greenberg and Buxton write in their CHI 2008 paper "Usability Evaluation Considered Harmful?":

> *"Usability evaluation, if wrongfully applied, can quash potentially valuable ideas early in the design process, incorrectly promote poor ideas, misdirect developers into solving minor vs. major problems, or ignore (or incorrectly suggest) how a design would be adopted and used in everyday practice. The curriculum stresses the teaching of evaluation methodologies as one of its major modules. This has certainly been taken up in practice, although in a somewhat limited manner. While there are many evaluation methods, the typical undergraduate HCI course stresses usability" (Greenberg 2008).*

2.5. Other Existing Work

Imaging galleries and applications are not exactly rare to find. Vast amount of software has been written for various purposes from sketching to medical applications. In this chapter, however, we survey a few

exemplary applications which we can learn from while designing our own product.

2.5.1. HIIT – Mobile Media Metadata for Mobile Imaging

Marc Davis and Risto Sarvas introduced a mobile imaging prototype that concentrated on gathering metadata (Davis, 2004). The prototype, Mobile Media Metadata (MMM), connected to a corresponding server to utilize networked metadata resources.

The prototype utilized a mobile device's XHTML browser and a small client software. Among the most notable lessons from their efforts was the connection between their server and the client software. This made it possible to connect to data arriving from multiple users. Other areas of interest were the metadata and which aspects of it could be used to enhance the appeal of the software.

Due to the focus of the metadata and the technical limitations in the prototype, the MMM software as such as was not considered as suitable starting point for the MMM prototype seemed to concentrate heavily on the technical feasibilities whereas our focus was on more hedonistic aspects.

2.5.2. ShoZu

ShoZu is an application that connects mobile phones to various Internet services such as Facebook, YouTube, Flickr and Blogger. In addition to simple upload or download functions, it also allows subscriptions to RSS feeds, video podcasts, status updates and geo-tagging.

Figure 4. ShoZu mobile client on S60 devices.

The functionality of ShoZu offers is robust. However, complications soon arise as ShoZu does not offer their own service but tries to integrate to already existing ones. Further, it does not offer media management functions and leaves them to the native applications. Hence we regard ShoZu as a third party add-on application instead of being a standalone full-fledged application.

2.5.3. Nokia Share Online

Another 3rd party application worth considering is Nokia Share Online version 3.0. While not a single solution, Share Online does offer a more polished integration to the mobile device than ShoZu. Still, it does not replace the native gallery applications but works in parallel. As with ShoZu, it does offer alternative services to use, of which OVI is one of many possibilities.

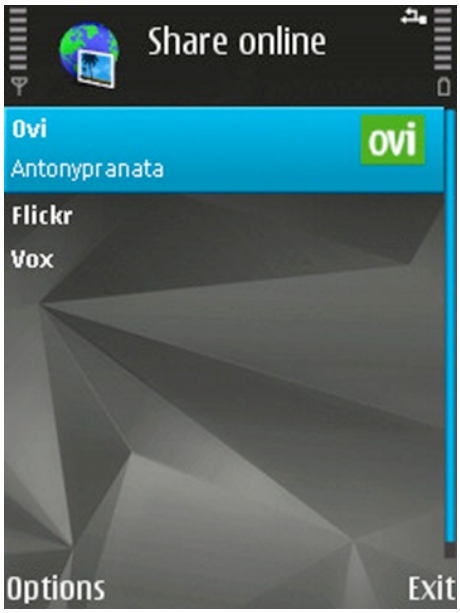

Figure 5. Share Online on S60 device.

Due to multiple reasons, Share Online became out first benchmark to compare with. Results of these tests is done later in this thesis under the chapters dealing with user evaluations.

2.5.4. Nokia Gallery

An example of gallery application that concentrates on image browsing instead of service integration is Nokia Gallery. It is being shipped to consumers as of writing this thesis.

Figure 6. Nokia Gallery on contemporary S60 device.

The application contains support for multiple different media formats, such as audio, images and video. All of these are treated locally, but there is no native service component.

Image browsing begins with a carousel where the currently selected image is shown in the middle. Images are ordered by time, and various kinds of information of them are available.

2.5.5. Flickr

Perhaps one of the most known image sharing services is Flickr. While Flickr does not have its own mobile clients, several 3rd party applications offer the possibility to post images taken with mobile phones. Nokia Share Online mentioned earlier is just one example of such applications. Further, exporters to some popular desktop applications exist as well.

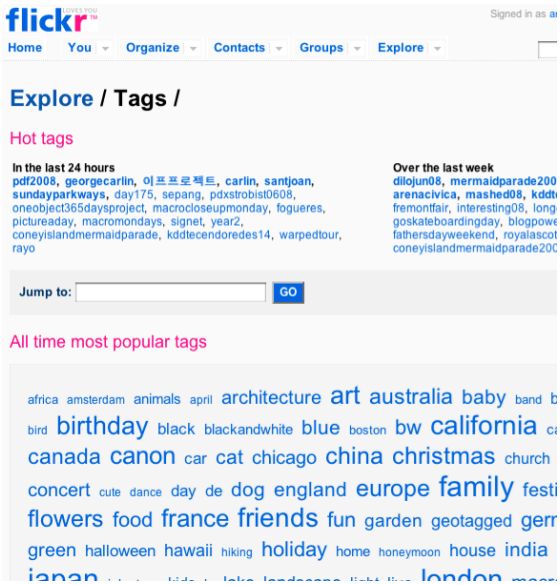

Figure 7. Flickr is utilizing tagging in its image management and exploration features.

In here Flickr is introduced as an example of a category of applications; other services such as Photobucket and SmugMug offer similar possibilities for the end users and seem to target similar kind of an audience. Differences do exist, however, even if those differences are deemed to be less fundamental.

2.5.6. Facebook

Facebook has been recognized mostly as a social networking site, but it does facilitate image sharing as well. It supports features such as tagging and albums, which are not only for organizing but also connecting people. For example, a user gets notified when his friend tags an image with his name.

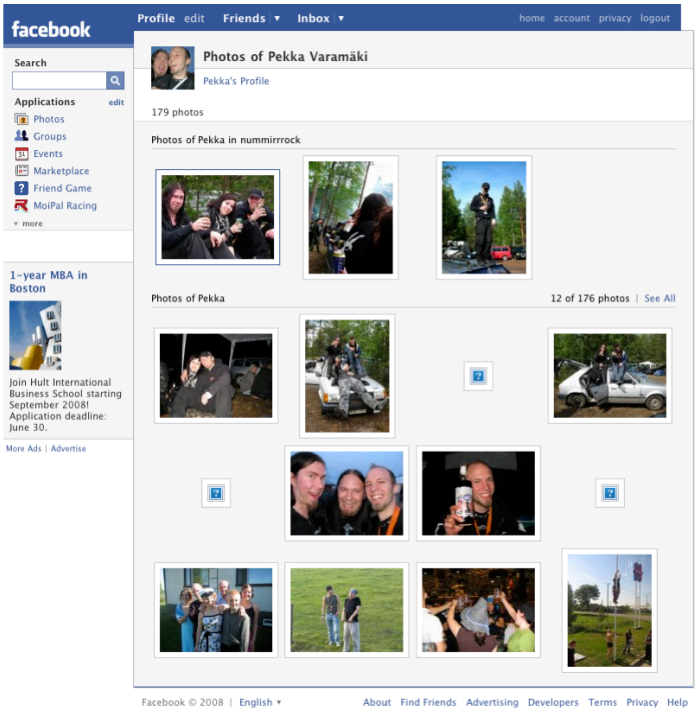

Figure 8. Browsing images belonging to a friend in Facebook.

It is to be noted that as of this writing, Facebook had gathered 1.7 billion user-submitted photos by May 21st, 2007, and was said to grown by more than 60 million images per week (Beaver, 2008). This can be seen as a sign about the importance of social networking to tasks such as photo sharing and how that activity integrates to our social network.

2.5.7. Apple Web Galleries

Apple's offering in web based image service space is interesting in the way that it does not promote features that are practically omnipresent in other competitors. For example, sharing and tagging are available only in most fundamental forms, which seems to indicate that they are not Apple's core offerings.

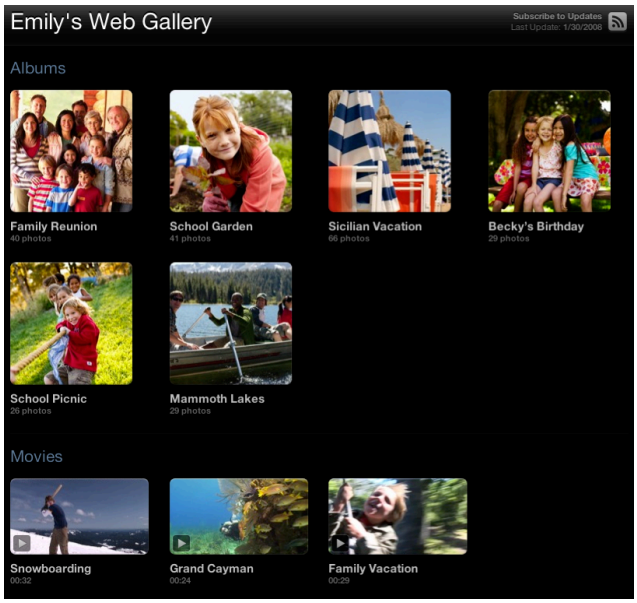

Figure 9. Example interface from Apple's Web Galleries.

The service is integrated to a desktop application called iPhoto. This is, however, only a publishing channel as no information seems to be tracked back from the service side. Other bindings are available via email, and can be used from Apple's mobile terminals as well. This is also limited to information management to the service.

2.5.8. Picasa Web Albums

Picasa Web Albums is another web-based imaging service that has integration to desktop applications provided without 3rd party support. This is done via desktop gallery software, Picasa, which can be used to maintain and archive one's personal image collection. A typical workflow would be to transfer images from the camera to a personal computer, import them to the Picasa software and export selected images to Picasa Web Albums for publishing and sharing.

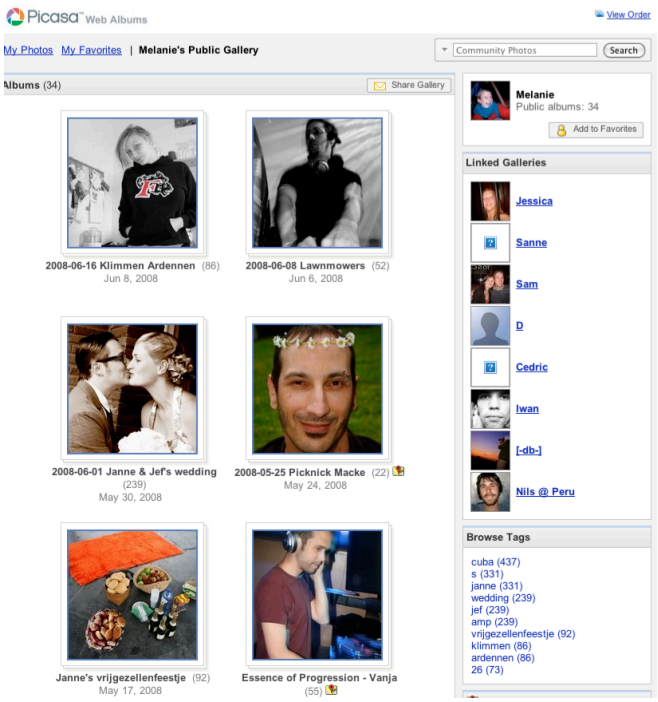

Figure 10. Screenshot of Picasa Web Albums.

Picasa Web Albums is likely to develop further after the introduction of Android. Android is Google's operating system for mobile devices, and it is not an unfounded guess to assume it will offer some form of integration between Picasa imaging service and the images produced by mobile devices running Android.

3. Designing for Experiences

"The difficult we do immediately. The impossible may take a little longer." – old proverb.

3.1. Market Size and Limitations

The customer base of a largish consumer electronics company can realistically reach 10 million people in a short timeframe for a given software offering. This varies depending on the exact product but is generally in the range of half a year to two years with the devices relevant to this product. After our development efforts with the S60 browser, the number of devices with the browser installed reached 10 million in roughly nine months after it was introduced. The browser's lifespan is not tied to a single device and thus we can assume that the number of audience may multiply over the years. Further, these numbers reflect the "smart phone" category from 2006, which was a niche category by itself. While the potential audience is not the measure of actual users it is a guideline that needs to be kept in mind while designing for similar devices.

For comparison, *Titanic* has been estimated to reach 55.3 million viewers in 1998. *Lord of the Rings: Return of the King* reached 43.5 million viewers in 2003 (Nielsen Media Research, USA Today 2005). It is

important to note, however, that these numbers are actual viewers (users) instead of potential users. Compensation is likely to come from time aspect and increased adoption rate of new technology. Thus it is reasonable to assume that over a lengthened period of time we are targeting a potential audience close to blockbusters similar to these examples.

It should be evident that the solutions and experiences being sought must be applicable to an audience of vast scale and span across different cultural norms. This thesis researches the questions about experience design from this particular point of view and considers niche audience acceptance not satisfactory enough.

3.2. Segmentation and Target Audience

It is extremely hard to please everybody. It is almost equally hard to design for everybody. If it were not, we'd not need ten different ketchup brands on the shelves of the grocery stores or multiple different amplifiers from the same manufacturers in Hi-Fi stores. Without further and proper justification, let's assume that designing for everybody often creates products that tend to be mediocre to most users. Similarly, let's assume that it is easier to design for a specific target audience that mostly meet their requirements well or very well. What happens to the product adoption rates in consumer market space?

The model presented in Figure 11 attempts to model this situation. It assumes that the interested audience is equal and constant over time, and thus the total area under each curve is equal as well. Assuming that designing for all, as is often the case with usability driven design, leads to mellow products, the situation is modelled with an equal distribution (red arc) where most people are indifferent about the product or system. Yellow curve presents a hypothetical design that has a high number of users who love the system and who hate the system. Finally, the green curve presents the situation of a successful product that is mostly liked with very few people hating it, which is quite an ideal situation.

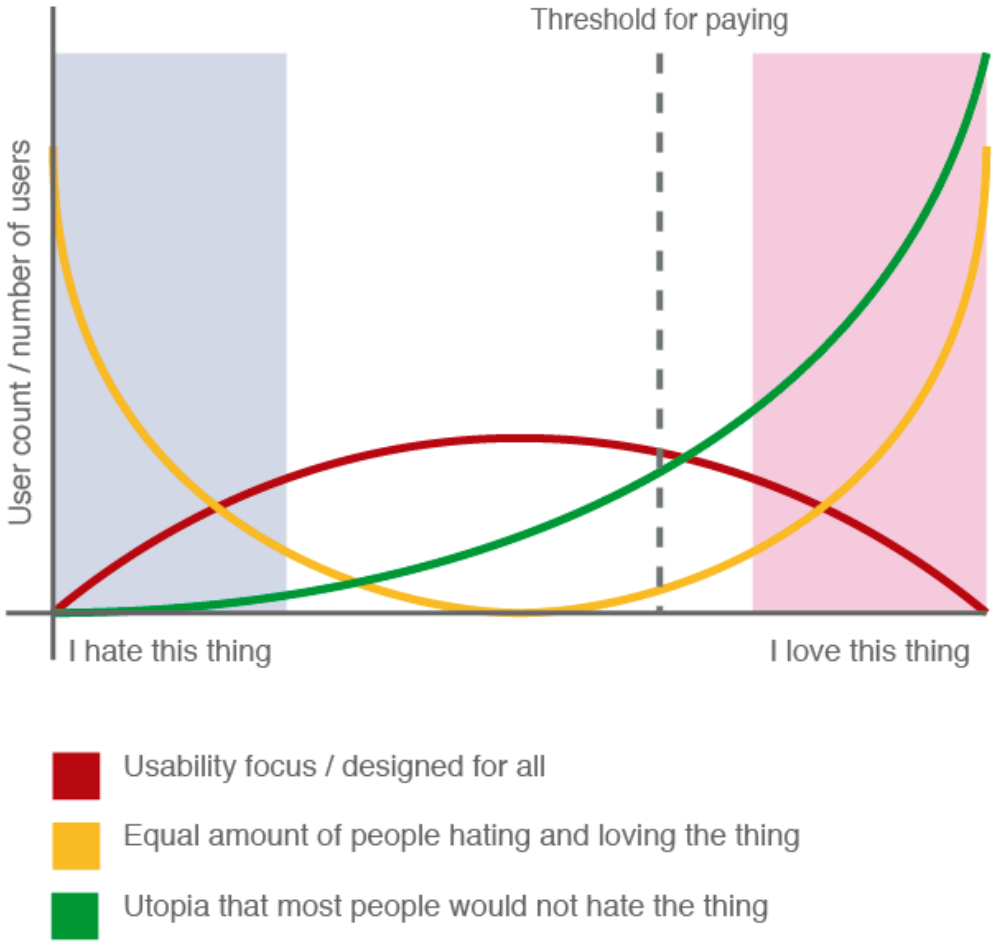

Figure 11. Segmentation depends on the maturity of the market and the expectations of people (paying threshold) versus the benefits they gain from the system. The figure by the author.

Assuming that everybody will get the product anyway makes all of these approaches equal. However, that is not the case, as acquiring any product has always an associated cost, whatever form cost takes from money to time spent learning to use the system. This imaginary line in Figure 11 is the "threshold line". Thus, the vertical location of the threshold line is the determining factor of which design philosophy is the most beneficial. The lower the associated costs, the more left this threshold line is and the higher the entry barriers are the more right the line resides.

Assuming the situation where there is only one vendor whose product does a task that the user absolutely needs to do, this line resides on the very left. There is no competition and there are no alternatives, so the only system available can even be needed and it is still gaining a large audience. However, as the initial demands for the products rise, the balance shifts towards the right. If the product is not deemed more valuable than the costs of paying, it is left on the shelf. This penalizes products that are designed for more than just those that have a focused

target audience. This is caused by the fact that the more towards the right the threshold line is, the larger the area under the yellow or green line compared to that of the red line.

As a side note, it should be evident that the model also assumes the audience has the full information about the product available and it is understood at the point of purchase. This, of course, is an unrealistic assumption. But from the product design point of view, there is very little that can be done to affect this situation other than trying to create as good of a system as possible and assume that the other factors are planned accordingly by the people responsible for them.

In practice this means that if you operate in competed market space, defining a target audience and designing for that audience well can lead to larger benefits than trying to please everybody and create compromises while doing so.

Not so surprisingly, trying to introduce a new imaging service in a well-established area practically dictates a focus on usability and user experience. Aside from hoping to bring novel technical innovation to the audience and thus pushing the threshold to left, the service was also aimed for a specific kind of users and needs and meet their requirements as well as possible.

We chose to target relatively young and internet-aware people who were not new to Internet services. They were assumed to be mostly between 25 to 35 years of age with even gender distribution, have relatively high-end mobile terminals and have flat-fee data plans on their mobiles. However, we did not assume technical skills beyond the capability to use existing digital services. This maps relatively close to what can be categorized as “Facebook” generation.

3.3. The Paradox of Choice

In light of the market segmentation, it might seem appealing to design products that offer features for people who are looking for different aspects in software and services. It is, in fact, possible to offer people options to customize even individual software or offer multiple different ones to choose from.

In some cases, choice has even been considered a virtue on itself. Offering a choice is also an easy solution for a design problem. Instead of making a decision, it may be quite easy to implement multiple alternative ways to do the same thing and offer a toggle that users can change to alter the behaviour. But this approach has the danger of leading to needlessly

complicated interfaces and worse, causing, for example, user anxiety (Schwartz, 2005). Barry Schwartz lists four reasons for this in his TED talk: regret and anticipated regret from the choice, the opportunity costs of what other good things the choice cost us, escalated expectations since we have so much to choose from and finally the possible self-blame from making the wrong choice. The following excerpt demonstrates issues with trade-offs, which are essentially also choices (Schwartz, 2003):

> *"Participants were told that Car A costs $25,000 and ranks high in safety (8 on a 10-point scale). Car B ranks 6 on the safety scale. Participants were then asked how much Car B would have to cost to be as attractive as Car A. Answering this question required making a trade-off, in this case, between safety and price. It required asking how much each extra unit of safety was worth. If someone were to say, for example, that Car B was only worth $10,000, they would clearly be placing great value on the extra safety afforded by Car A. If instead they were to say that Car B was worth $22,000, they would be placing much less value on the extra safety afforded by Car A. Participants performed this task with little apparent difficulty. A little while later, though, they were confronted with a second task. They were presented with a choice between Car A, safety rating 8 and price $25,000, and Car B, safety rating 6, and the price they had previously said made the two cars equally attractive. How did they choose between two equivalent alternatives?*
>
> *Since the alternatives were equivalent, you might expect that about half the people would choose the safer, more expensive car and half would choose the less safe, cheaper car. But that is not what the researchers found. Most participants chose the safer, more expensive car. When forced to choose, most people refused to trade safety for price. They acted as if the importance of safety to their decision was so great that price was essentially irrelevant...*
>
> *Even though their decision was purely hypothetical, participants experienced substantial negative emotion when choosing between Cars A and B. And if the experimental procedure gave them the opportunity, they refused to make the decision at all. So the researchers concluded that being forced to confront trade-offs in making decisions makes people unhappy and indecisive.*
>
> *Confronting any trade-off, it seems, is incredibly unsettling. And as the available alternatives increase, the*

> *extent to which choices will require trade-offs will increase as well."*

Thus it follows that users should not be forced to make choices any more than what is necessary. In practice this means assuming defaults that hopefully work for majority of the target audience and in case that the audience is mostly undecided, offer an option only if absolutely needed. It also means that if there are multiple ways to achieve a functionality, in all but very rare cases the design might be better off making a decision even if it was not optimal for everybody.

3.4. Design Drivers

3.4.1. Role of the Computer

One of the fundamental philosophies for this design work was to see a computer as a tool that is built to help us. In that role, our thought was that computers should adapt to our needs instead of us adapting to them. This could be debated, and different views have been offered by researchers such as Dougas Engebart (Moggridge, 2006). Our stand was more closely aligned with Raskin's (Raskin, 2000).

If the computer is there to help us and make doing things easier for us, we need to consider a few scenarios. First one needs to deal with the easiness of knowing what to do with the system and the system's learnability. In the long run, though, other factors such as efficiency need to be taken into consideration as well. At times even these two factors may not be fully orthogonal, and thus compromises are needed.

Part of making life easier for the user leads to some other aspects that need balancing. Some of these are crucial, such as privacy and trust between the user and the system. There are also easier to implement philosophical drivers, such as the idea that the system should not prompt the user for information if it already has a chance to know it. An example of this concept is our user identification based on phone number – an aspect that the system should already know without the user ever typing it in.

3.4.2. Pervasive Internet Connectivity

It was decided early on that the imaging solution would be driven by the assumption of widely available Internet connectivity. This was a controversial decision as the majority of mobile users even within the assumed target audience are not likely to have flat-fee data plans.

However, it was also known that the desired solution would not try to appeal to the maximum number of people but instead try to explore what would be possible within the unavoidable restrictions such as available hardware and current mobile infrastructure. For these purposes, assuming pervasive Internet connectivity seemed to be a reasonable starting point.

3.4.3. Ease of Use

Perhaps the strongest motivation in the design process was an attempt to create a system that was as easy to use as reasonably possible. The system would still need to be complex enough to allow the users to gain benefit and pleasure from using it.

3.4.4. User Experience

User experience is a separate thing from ease of use. While a system can be easy to use, it does not guarantee a positive experience for the user. For one, a system with a single button in it can be extremely easy and intuitive to use for people, but unless it fills the expectations of what it should do it can turn out to be a failure.

Similarly, we can create interfaces that present the users with multiple simple questions to fulfil their task. However, splitting a complex task into small simple parts may make it easy to use but can also make it inefficient. In extreme cases such can wield the system unsuitable for actual use despite being simple.

This project tried to study how far we could go to make the users feel pleased and happy to use our system. As such, we could not rely on ease of use alone. Further, this thesis does not deal much with usability, but with concepts dealing with the subjective and hedonistic aspects in the design process.

3.5. On Fairy Dust

In my previous experience, some projects have run into issues with user acceptance while some have met their targets. In retrospect, this chapter outlines topics that I've found crucial during the development. They can be considered as "fairy dust", providing possibly invisible and at times neglected ingredients that can make a difference between a success and a failure. Additionally, each of these topics reflects on the eXposure design and how it handles the listed issues.

3.5.1. Laziness and Personal Time

One of the key concepts that seems to be easily forgotten in the hands of enthusiastic developers is that the actual end users may not consider the application being developed to be the most important thing in their lives. In fact, especially when dealing in consumer domain such is unlikely to be the case. Thus a conflict arises – on one side the developers are keen to invent functionality and features that seem to make the life of the users easier but come with the cost of learning. Users, on the other hand, may not know what the application does when they start to use it and have limited motivation to see the benefits it might offer.

In general, if we look at the offerings from a consumer's point of view, the world is full of offerings. Naturally, some of these are more relevant than others depending on the user's needs and the context he is in. Some of these needs are basic such as the need of food and shelter, whereas some deal with more abstract wishes. However, all of the needs can be fulfilled in multiple ways and often by multiple vendors. The user needs to choose which offering he will take.

Figure 12. Street view from Shinjuku, Tokyo. The streets are full of advertisements that compete for customers' attention.

In this context the offering will be an application. Regardless of the actual monetary price, users will always make an investment when they take an application into use. Economical value is the most direct example of this, but even if the piece of software is free there will be at least an investment of time. This time consumption consists of several factors:

1. Finding out about the product and obtaining it
2. Taking the product into use and learning to use it
3. Using the product
4. Moving on from the product

It is often an impossibility to learn and study each and every alternatives available before making a decision on which offering to choose. Further, as people try to compare more alternatives, time for each individual alternative decreases. The number of options increases the time to give each one a fair chance diminishes.

This thesis is not about marketing and thus the question of finding the product lies outside the scope of this writing and much of my personal work as well. This does not make these aspects any less important, however, but these will be left to the marketing experts.

The second aspect after, finding out about a product is the ability to take the product into use and learn how to use it, is of great importance as well. Once the product is found, the user needs to take it into use to determine if it will fulfil his expectations. Any obstacles increase the expected pay-off that the application needs to deliver for the exchange of the effort the user needs to spend to learn to use it. This naturally varies depending on the application and the user. The requirements and needs for enjoyment and fun are quite different between, for example, media applications and banking software. But in any case, if the user has awarded the application time and effort to learn how to use it, this trade-off should be acceptable in the continued use as well.

I've tried to avoid using concepts such as usability as that is not the only, or in some cases even the main factor, that the user is looking for. While usability is often an integral part of the balance between time spent and the returns, other factors such as enjoyment can be equally important. These factors depend on the application, or other product, in question. As an example, a movie can be viewed during a two hour-long train ride. The same situation arises when the user decides how he would like to spend his time and whether the movie in question meets his expectations.

An important conclusion is that the reactions and the lack of attention towards your application is not necessarily a result of users' ignorance, but your failing in offering appealing benefits that justifies the investment of time and effort the user has given to your work.

In a similar vein, the user should not be forced to make choices that are irrelevant to him. This is even worse if he does not understand what he is asked, which is often the case when taking something new into use. However, it remains debatable what these critical questions are. My

personal opinion is that the user should not initially be asked any questions that do not deal with outside aspects of the system or the user's well being. An ill example can be found from the initial start-up many mobile phones put the user through as they ask the user to specify time and date instead of defaulting to using network time (time and date that the mobile phone can retrieve from the mobile network). Such behaviour does not cause user harm, and the cases where the result is correct ought to outweigh those where it isn't. On the other hand, the mobile imaging client described here is forced to ask permission from the user to use network connections as making assumption could lead to direct monetary harm to the user. As it is also the only question asked from the user and network integration is an important part of the whole concept, the question was not considered to be too obtrusive.

3.5.2. Responsiveness and Speed

The single most crucial aspect of creating positive user experiences seems to be speed and responsiveness of the user interface. Naturally, being fast does not guarantee positive results. However mundane and uninteresting speed optimization might be for the development, it does seem to be one of the most important showstoppers if it is found to be inadequate.

Such factors are emphasised in mobile environment where the users attention span is short. Typical usage situations are short waiting periods – waiting for the bus to arrive or killing time while waiting for a friend on a street corner. Often the surroundings also demand concentration and create additional cognitive load, as happens while walking on the street. Not only does the user need to pay attention to the mobile device, but also to the traffic that surrounds him. Thus it is easy to see why speed plays an important role.

However, the system does not need to be extremely fast. It only needs to be fast enough to not make the user wait. This includes both the actual performance as well as latency. In short, system should perform so well that the user does not need to wait unless it is absolutely unavoidable (Tognazzini 2008). Once this limit is reached, benefits to user experience start to diminish.

3.5.3. Perception Equals Reality

Reality is a curious beast, and often overrated when it comes to offering experiences. Perhaps one of the most obvious examples, filmmaking, is based solely on creating an illusion that is immersive but not real. This is especially true regarding computer animation where everything visible is

created for the purpose of the production. Further, in many cases what does not show in the final image can be omitted. To create an illusion the houses can have only the front walls, the rain can come from sprinklers and altering object positions in depth can give false impression of size as shown in Figure 13.

Figure 13. Forced perspective is used to hide the true size of the actors and create an illusion of a small size hobbit. Lord of the Rings: Fellowship of the Ring, New Line Cinema.

Aside from the artificial illusions, there are many other occasions where reality gives way to perception. Even everyday concepts such as colours are result of perception and not absolute truths. This can be seen by altering the background of a solid rectangle and noticing how the perceived colour changes.

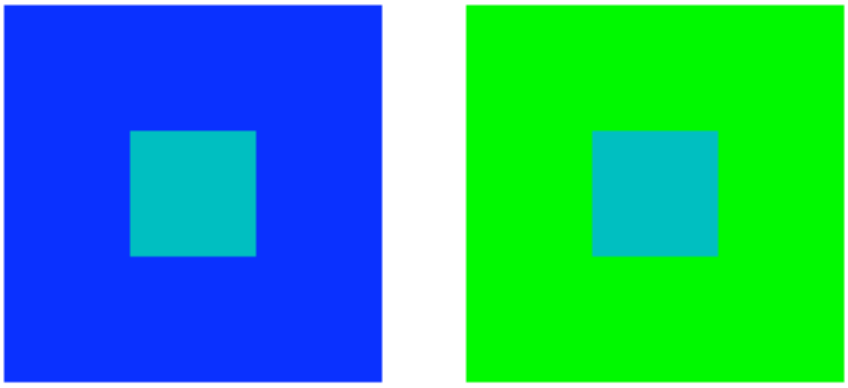

Figure 14. Backgrounds affect the perception of the colour. The inside rectangles have the same RGB values, but appear in different colours depending on which background they are placed on.

Illusions are, actually, what computers are based on, only that we do not call it magic or illusion but abstractions (Dourish 2004). Computer

systems operate on electrical signals, which in turn consist of electrons moving in conducting materials. However, abstraction after another has been built to hide the physics of the machine and replaced with various libraries and blocks of code. Finally, the user is presented an interface that is yet another abstraction. Thusly, what truly happens inside electronic gadgets is a mystery to most of us.

In a similar fashion, abstraction levels can be increased to hide technical implementation to the extent that interfaces just seem to work. Applications can, and in my personal opinion should, guess what the user would do next and prepare for it. Further, it is possible to take advantage of user behaviour to do things that otherwise might seem impossible given the current technology. I'll describe two scenarios that are used by eXposure imaging application which relate to the aspects of responsiveness and behavioural factors.

First one of these two examples deals with the speed of the eXposure S60 interface. Due to technical issues the speed of rendering text was not sufficiently fast enough to smoothly resize and rotate them. This was needed to support rotation of the screen between landscape and portrait modes. Such action created a delay that forced the user to wait before he could see the comments in the new aspect ratio, but this was masked by the means of simple animation. Comments were made to fade out just before the image would be rotated and fade back in after the rotation was done. This actually took more time than simply placing them onto the image as quickly as possible, but the constant motion and the perception that the application was doing something made the situation feel more pleasant. Similar tricks are used elsewhere, as well as in Apple's iPhone. When taking an image with the built in camera, the iPhone needs a moment to save the sensor data into the memory and create the actual image. This moment is masked by an animated shutter that hides the resulting delay. Situations such as these are not, in fact, much different from the reasoning behind loading icons and progress bars, but concentrate more on the hedonistic aspects instead of the utilitarian ones.

The second example takes advantage of behavioural aspects and typical usage patterns. One of the driving use cases for the imaging service was to allow users easily move and view their images on their personal computers. In practice, such operation means transferring data from their cameras to their computers, and is often, but not always, done manually with memory card readers, over Bluetooth or by uploading to image sharing sites such as Flickr. However, mobile cameras are often used to capture surprising events of everyday life and are by their nature mobile. In such circumstances the photographer is not likely to immediately view his new images on any computer, even less on his own. Thus, it is possible to detect newly taken images and start transferring them to an image service or to a PC without user intervention. When the user eventually sits before a computer screen and browses the images

with a web browser, he can already see the images he has taken. In reality, transferring large images via limited cellular connections takes time, but in the above scenario the perception is that there is no wasted time and effort.

While the idea of casting illusions sounds alluring, the problem with abstractions comes when the illusions break for one reason or another (Dourish 2004). The software can have programming errors, or in the case of networking applications the network itself may be unusable or unavailable for unknown reasons. In fact, all sorts of reasons can cause the user to run into error situations. The more there are layers, abstractions and illusions, the more there are chances that some of them fail.

The errors themselves are not too big of an issue. The real issue is that a carefully crafted illusion may have disconnected the user from the events that happens underneath the hood of the application. As a result, the reason for the error may be incomprehensible and may not make any sense. Some of these problems may be alleviated by careful explanations of the situation and ways to recover from it. Further, the error situations may not be solely technical but also social. As an example, it would be possible to create a communication system that would combine the usage of phone calls, email, SMS, MMS and instant messaging (IM). However, each of these has their own characteristics when it comes to how they are being used. An SMS is instant, but typically less urgent than a direct phone call. An email is assumed to be delivered with delay and is typically more formal than an IM message.

For reasons such as these there are occasions in which it is better to present the system state and functionality to the user without artificial abstractions. Such situations are likely to be heavily dependant on the exact system being built, and thus generalizations seem difficult to state.

3.5.4. On Physical Interaction and Simplicity

It is the people who will eventually use consumer services such as the one describe here. As the system is ultimately a collection of logic rules that happen inside electronic devices, there will also be an interface between the machine and the person using it. However, interaction with this logic is a wider concept that what it might first seem to be.

Systems and products are not used in vacuum. In this case particularly we can even generalize that the meaningful interaction actually happens between the people themselves, or, the very least, between a person and the surrounding world. This happens since the images that are taken are taken for a purpose. This purpose can be a selfish act, where the image is

taken and utilized by the same person. In other cases, the image is possibly shared between the people and thus the interaction occurs between them. Other examples also exist, but for the purposes of this thesis none of these scenarios take away the role of a human actor who acts in a physical world together with a physical world. In fact, even simplistic activities such as seeing can be tied to the act of *doing*. Further still, being and experiencing is integral part of even abstract activities such as thinking (Heidegger, 1927).

Following this thought, if the experiences are caused and observed in relation to the physical world and our ultimate motives of interaction do not deal with the electronic devices, the interfaces should focus on aiding the users to fulfil their goals. In the scope of this thesis these goals are social more often than dealing with the user and the physical world. For example, our user needs study in Tokyo showed that the motivation for many people interviewed was not to capture beautiful images, but show others what they are doing, how their surroundings *feel* like and how they are thinking about their dear ones. Interaction design, thusly, is about facilitating communication between users and, in some rare cases, the surrounding world itself. The study itself is described later in this thesis.

Before venturing onwards, let's consider the hierarchy of interactions as Oxford American Dictionary defines the verb *interact* as (referenced on May 22nd, 2008):

> *"[to] act in such a way as to have an effect on another; act reciprocally : all the stages in the process interact | the user interacts directly with the library."*

Interacting, by its definition, is not limited to human-to-human actions. I would argue that the reasons for interaction often come from social motivations. These motivations are carried out by interacting with the physical world and ultimately coming down to pressing buttons to make digital devices to things that we wish from them. In cases of digital artefacts, the human-to-machine interface is a needed abstraction to allow us to deliver messages contained in these artefacts to other people. Thusly, and especially in the case of this imaging service, we have:

1. Social motives that are carried out by…
2. Digital artefacts that are manipulated by…
3. Human-to-machine interfaces that consist of…
4. Physical interfaces with which user controls possible…
5. Software interfaces of the device.

The exact order of items remains arguable and the separation between physical device and the interface it contains is becoming hazy in some sectors (Buxton 2008 [2]). Interestingly, though, the hierarchy describe above also lends itself to highlight the concept of *direct manipulation*. In principle, it ought to happen that the higher in the hierarchy we can move the cognitive load of the user and less abstractions there are between the user and his intent, the easier and more pleasant the system ought to feel. This naturally assumes positive outcomes that are not always guaranteed even in social environments.

To argue further for direct manipulation, let's have a look at the history of computers and computing as described by Paul Dourish (Dourish, 2004). The computers started as mechanical devices that helped people to do computing. Due to various reasons the mechanical implementation changed to electronic signalling which allowed focusing more on logic of the computing instead of the mechanical implementation aspects. A level of abstraction was taken off from the shoulder of the designers of such machines. Later on the designs were adapted to use customizable wiring and, further still, started to utilize punch cards; cards that had holes in them that described what the machine was to do. This time it was the electrical implementation that was taken off from the users shoulders. The interaction further focused on the user and the task that he tried to accomplish.

The punch cards turned into command lines, which in turn developed into graphical interfaces that are prevailing today. Interestingly, the development towards the direct manipulation was also present. Instead of writing what the machine should do, joysticks allowed one to move cursor on these graphical displays to select what sould be done. Mice then turned this moving of cursor into pointing. While the difference is subtle, it is meaningful; moving cursor forces one to utilizing an interface abstraction whereas pointing deals directly with the object in question.

In the last few years, touch interfaces have been becoming increasingly common, especially after the commercialization of multi-touch. While neither of these technologies are particularly new, their acceptance and utilization in consumer space is. Each can also be seen as a continuum towards directly manipulating digital artefacts. Basic touch technology accomplishes this simply by removing the task of operating mouse and multi-touch allowing multiple pointing devices to be used (multiple fingers, for one).

But it is not only computers that have gone towards interaction models where the user deals more directly with the content. Radios have gained automatic tuners instead of finding the radio stations manually and car manufacturers are including increasingly sophisticated technologies such as automatic gearboxes and traction control systems to help the drivers concentrate on driving.

The argument above can also be used to advocate perceived simplicity as well as certain parts of ubiquitous and tangible computing practices. This thesis, however, does not deal with such aspects with the exception of striving for perceived simplicity. Simplicity itself can often be seen as a by-product of interaction design.

The imaging system described in this paper had to operate in an existing environment and utilize existing platform and devices on top of which it was implemented. In practice this meant that the physical devices were mostly fixed and could not be tampered with. However, existing physical features could be taken advantage of when they did exist. For example, N95 multimedia computer included accelerometer that was used to rotate the image according to the orientation in which the device was held. This effectively meant that the users needed not to operate both physical and software interfaces and could concentrate on the physical.

Furthermore, the interaction paradigm focused on utilizing the joystick as an extension of the users finger where possible. The joystick directions moved the focus from one element to another on the selected object and pressing the joystick initiated features on top of the selection. Not only did the behaviour simulate touching to some extent, it also allowed context sensitive menus to be drawn based on what the user had selected. This in turn decreased the visual clutter on the interface and was one of the carrying themes on user interface design.

However, this solution was still not as good as direct physical touching, but the latter was simply not possible with the given devices. The devices themselves were fixed given the market situation and expected size of the audience.

3.5.5. Delivering More Than Promised

It may seem self evident, but good experiences are triggered by positive events. Thusly, it is imperative that the positive events occur in the first place. Better still, experiencing positive surprises can be hoped to be more memorable and thus offer greater emotional impact. In practice this basically means that the user should not know all there is to know about the product in question. Otherwise offering surprises would be a futile attempt.

This kind of aims easily conflict with the most obvious marketing aims to some extent. To let people know about your product, service or exhibition, it needs to be made interesting to the audience one way or another. Easy solution to this is to market why it is helpful or desirable to the users. However, if all about the product is revealed beforehand, surprises do not occur anymore.

In the case of this imaging service, we deliberately left some of the features we considered fancy without mentioning or giving any usability hints on finding them. Most notable of these was automatic screen rotation that utilized accelerometer in the targeted devices. When viewing images, the accelerometer animated the image rotation so that the image itself was always kept in closest 90-degree orientation (the top of the image pointing up). When the user physically rotated the phone, the image remained in the orientation and was fit to the screen if scaling was needed. Results of this feature are further analyzed in later sections of this thesis.

3.6. Making Magic

The sections before already outlined more philosophical issues dealing with the design. They also reflected our answers on how the issues were dealt with. However, it was not explained what kind of a process lead to these given solutions.

This process is an important aspect to understand, as there are factors that the design needs to address either explicitly or implicitly. Human factors are not always considered from the very beginning, which can lead to a situation where user interface and interaction design is done under heavy constraints. Another seemingly common scenario is that concept design is outsourced, which can lead to a disconnect of what is feasible currently and what might be made possible.

For this particular case, the driver was on user research and the human factors. Where possible, the technology served these needs but as always, there were also limitations. This section tries to explain how and why design decisions were made for this particular system and where the magic in it came from.

3.6.1. Wicked Problems

Designing actual systems that are put to use seems to always lead to compromises. In fact, it could be said that the design process itself is the process of making and filtering out choices (Buxton, 2007). The choices need to lead to an outcome within the possibilities that the team or project operates in. In a sense, these choices are answers, whether right or wrong, to the problems.

Unfortunately, though, there are set of problems to which there are no right answers and even knowing the right questions can be difficult.

Classical examples include questions such as the solution for terrorism, how to solve the climate change and how to get rid of poverty. The definitions of such issues can themselves be controversial or ill defined. They also depend on multiple aspects that may be un-cooperative, circular or their requirements might change constantly. In comparison, many mathematical problems can be called *tame problems* since the solution, if it exists, is often unambiguous.

Such complex problems are called *wicked problems*, and the design work of eXposure imaging service was essentially an example of such problem. The practical result is that many aspects cannot be known before the design is tried out in practice. It was necessary that the solution needs to be tested and iterated upon to draw any conclusions of its goodness.

3.6.2. Brief to Interaction Design

Interaction design is often understood as a creation of dialogue between a product, service or system (Kolko, 2007). It is often utilized to reduce user dissatisfaction, increase productivity and satisfaction. Interaction design also has common aspects with user-centred design (Wikipedia, 2008).

In practice, in interaction design one needs to balance between multiple stakeholders, including but not limited to the business, users and legal issues. After all, the system needs to be maintainable to remain functional, this often being a prerequisite of being profitable. The systems being designed should not break laws and ethical codes. System should also bring value to its users or it would be unlikely to meet its other goals. While the underlying decision doesn't necessarily rest on interaction designers, the design deliverables needs to achieve a balance.

However, the aims of interaction in this particular development process were meant as a broader entity. In our case it was not only a question of a person using a system, but people mediating to each other through the system. Thus, interaction design took place between the people and the systems role was to facilitate this interaction.

The difference is slight, but vital. If the starting point is to deal with a single person and a system, there is the danger of scoping the problem space in manner that concentrates on answering how the system can be used best instead of answering what is the best system.

3.6.3. What Should It Do?

As trivial as it may sound, deciding what a system should do is not self evident before the system is built. It is well known that the users often use systems differently than what the designers have planned. However, even in this case the audience does fulfil some of their desires. To maximize user satisfaction, we might do better if we could know and optimize for the actual needs for the majority of the users. While it may be difficult or even impossible to know the distributions and exact needs of a diverse audience due to the complexities of data gathering, it would be hard to justify not even trying to do so.

Somewhat simple methods do exist to help understand users better. Perhaps the easiest method is to review previous research work that describes the experiences of others that have worked on similar fields. Further, it is entirely possible to find representative users for interviewing and observing their current behaviour to understand them better. It does not harm the team to start actively participating the activities they are designing for. It should be noted, however, that even interviews and observations might not reveal future or latent needs.

The exact methods and approaches taken with eXposure imaging service are described more deeply in the evaluation part of this thesis.

3.6.4. Sketching Interaction

Sketching has multiple benefits when used in design. By sketching, one is forced to think about what he is doing. Further, by the definition of sketching what one creates is not the final out come, and thus the sketch itself can provoke new ideas. And finally, sketching is cheap and can easily be thrown away if found unsuitable (Buxton 2007).

Unfortunately, sketching interactive systems is not quite as easy as working with static drawings. By definition, interactive systems change over time, by the systems users. In other than the simplest cases, the interaction forms a non-linear structure in which the users somehow navigate.

Further complexities often arise from technical limitations. When considering the user experience of the final product, it seems fair to say that it is dependent on the implementation. Thus the design aspects and the technology together form and embodiment. This causes issues in approximating what the final system should feel like. While it is possible to create simple demonstrations of the ideal case, these can turn to hinder the final outcome by being too finished and inflexible to adapt to changes

that almost necessarily arise in production. Despite this, a holistic view would be preferable from the beginning.

Acknowledging these imperfections, the interaction sketching happened in phases. Instrumental tool in the process was an interface diagram, which tried to map how the system would be capable to support the previously mentioned scenarios and ensure that the resulting navigation hierarchy remained logical within the system. Figure 15 shows a version of the mobile interface diagram between iterations.

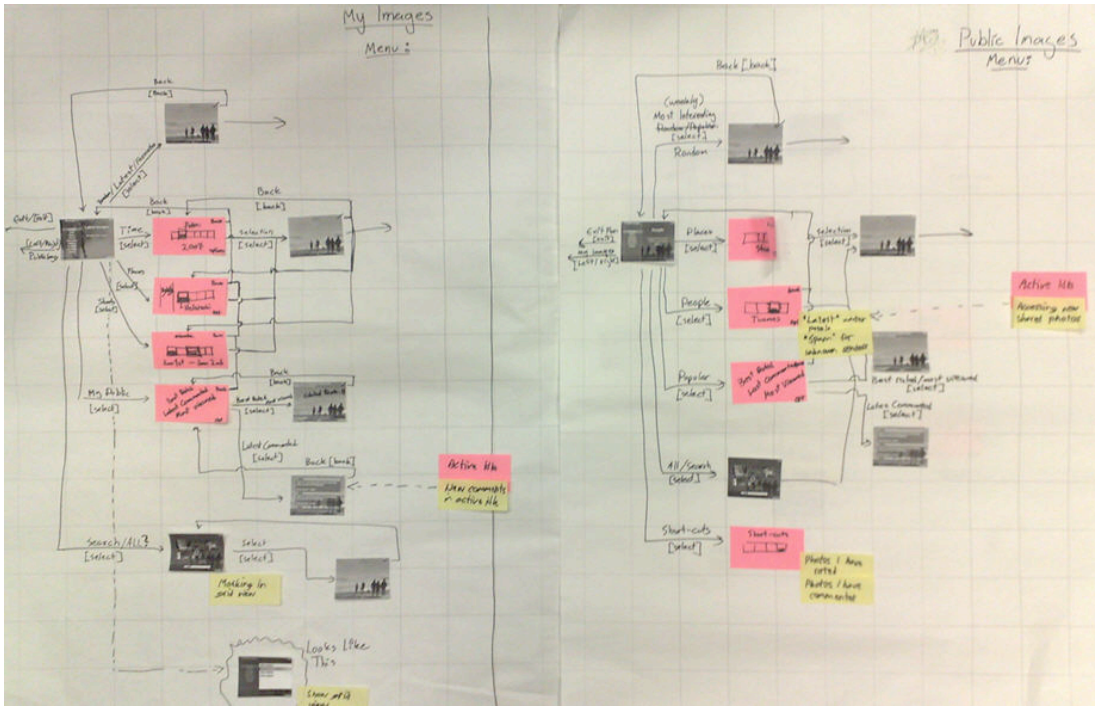

Figure 15. Partial interface diagram used to sketch out the initial mobile interface design. Grey boxes are UI mock-ups, pink notes present screens that are still missing whereas the yellow notes serve as comments and questions on the design.

The diagram above approaches the interface synthesis in a manner that might not be the most commonly used. The lines that connect the various screen mock-ups describe actions that trigger the transitions. The mock-ups come in different levels, depending on the problems that they present. The pink notes simply indicate missing screens and the functionality the screens should contain whereas the grey ones are pixel perfect visualizations of the screens. These were occasionally needed to be certain that the information can be fit to the screen and that the screens remain easy to understand. This is in contrast to rather common tradition to produce the interface diagrams as simple wireframes that leave the graphical visualization more uncertain.

Furthermore, some of the issues can be resolved on multiple levels. For example, visualizations can emphasise affordances that are mandated by

the hardware but do not flow as well with the visual presentation as they would if the hardware could be redesigned.

Interface diagrams are not able to solve all the issues with experience sketching. By their very nature, the diagram is not interactive and it does not even try to explain what happens between the screens. They are not very efficient in modelling time.

Interactive prototypes were produced to quickly estimate the feel of the software on computer screen. These were not complete and only concentrated on specific questions or mandated usage flows. This was mostly done to save time, as it was clear that the actual implementation would demand changes. The interaction allowed, however, better feedback from expert evaluations that were conducted with usability and design professionals to see if there would be obvious faults in the proposed interface.

3.6.5. From Prototyping to Implementation

Technological feasibility studies were started at the beginning of the project at the same time as the design work. While the design process was underway, technical choices were made gradually as the ideas matured and stabilized. Eventually this allowed the implementation even before the design was fully ready. The design process, in the meantime, tried to stay a step or two ahead of the implementation and not to hinder it.

The results was that it did not take excessively long before the interface ideas could be tested in limited fashion and the design could adapt to the limitations and possibilities that surfaced. Additionally, this allowed testing the system very early on. In fact, even the initial expert evaluations were able to try out the prototype on computer screen and use the actual mobile device implementation.

The progressing implementation also allowed prototyping to concentrate on exploring concepts that were not clear and that needed experimenting. The more, design wise, simple issues could be tried out in code to produce more immediate feedback.

3.6.6. Lowering the Barriers of Usage

If designing how something should work is not easy, then designing how something can work is even harder. While there are existing practices that deal with many aspects on how web services work, few take

advantage of mobile specific matters. Some of these advantages deal directly with the issues outlined previously in regards to laziness.

To lower the effort needed to try out and test the imaging service, it would need to be easy to take into use. Taking a service into use usually starts with a registration process where the user creates credentials for himself and fills in basic information such as his email address that can be utilized, as an example, to recover lost passwords. Other typical information usually include at least his username and password that can be utilized to log into the service. The password is typically filled in twice to make sure it is not mistyped. Additionally techniques such as captcha can be used to make sure that a computer program is not filling in the information for spamming purposes.

It ought to be needless to mention that filling out this information with a mobile keypad or touch-screen is a time-consuming process. This is even less delightful process given that the scenarios in which the mobile phone is used are often mobile. Time is possibly fragmented and the person using the phone is likely not going to have long moments to begin with.

As one of the research questions was to study how far one can go to provide pleasant user experiences, the typical solutions were not found satisfactory. In western world where mobile devices are in many cases personal devices, the process is also against the basic principles mentioned in chapter “Role of the Computer”. Filling in credentials is, eventually, redundant information that a personal device should know already. Of course, part of the blame lies on the handset makers themselves for not utilizing these aspects already.

It turned out to be possible to identify and establish a user account automatically based on the information that can be derived from the communication network. Eventually the needed input from the user was reduced to a single question (accompanied with explanation text) at the initial start-up of the application – “Do you want to allow network connections?” This question was, at the time being, unavoidable, as it would lead to issues of cost. As of writing this thesis, there are no standard protocols in place to detect whether or not network traffic generates costs to the end user or not.

User account can be, however, created automatically if these network connections are allowed. The default username is set to users phone number to allow easy access to the web service and it can later be changed to users liking. A default password is delivered to the mobile handset via SMS and is set to be readable from the S60 client interface for as long as it remains unchanged. The main benefit of the system is that the service becomes usable via a single confirmation screen. The registration system and its aspects dealing with user experience are further analyzed in IMSA paper (Vartiainen, Strandell, Kaasalainen

2008). Further benefits of tying the user account to his phone number include the possibility to let users change to new devices and have his account follow without any extra configuration steps. Phone numbers also benefit in scenarios where the users wants to share content to his friends that are using the system.

Accessing the web interface does prompt for more information at the initial login, but in no way demands it to be filled in. User can continue the usage with the mobile created credentials alone and the functionality that depends on additional information such as email simply remains disabled. Further, the information is prompted only at the initial login after which user needs to specifically go to set it under settings. This was hoped to annoy the user as little as possible yet still indicate that the functionality exists.

To address the continued usage, it was also wanted to ease image management as much as possible. As one of the basic design drivers was the assumption of pervasive Internet connectivity, the mobile client also implemented automatic uploading and downloading of images to and from users private account. When new images were put to the phone via the file system or by taking new photographs, the client detected them and uploaded the images to the server in the background to not disturb the user from what he was doing. Similarly, if images were uploaded to the server via web browser, they were transferred to users mobile phone automatically to create an illusion of a central storage space.

3.6.7. Issues of Joy

A big part of designing for experiences is to make sure that there is as little as possible that makes the experience negative, but concentrating mainly to minimize these aspects easily neglects the positive aspects. Taking this thought to the extreme, it might even lead to a situation where the system has nothing wrong with it but it is still lacking the qualities that would give its users gratification.

Earlier studies as well as the ones conducted in the process of this design process indicated several possibilities of enjoyment. Images themselves can be emotionally loaded, mediating feelings from a person to another. They are often shared with people close to each other, thus having an already existing emotional connection. Sharing can happen either in physically same place or via transferring the images to the recipients. A user can be the one sharing the image or receiving it.

To address this, the first phase of the implementation tried to make publishing images as easy as possible. Sharing was implemented later, and unfortunately was not tested early enough to be included in the

evaluation portion of this thesis. However, the tests made simulated the sharing scenarios to some extent due to the limited number of users within the system. The actual sharing was implemented later and it took the advantage of users existing social network in the form of the address book. Instead of creating new contacts, the system maps existing contacts to those in the users phone book and allows direct sharing to the ones that are already users. For the rest, other methods of sharing exist. The web interface allows sharing links to images whereas the mobile application connects to both SMS (Short Message Service) and MMS (Multimedia Messaging Service) features provided by the platform.

Additionally, the joy can come from passing time while, for example, commuting. Images that are viewed in such situations do not necessarily need to be ones own, even if that seems to be a common habit within the interviewed people. An alternative can be the exploration of other interesting images.

This lead to the need to optimise the image browsing as much as possible as well as to concentrate on the image content itself. Images, by default, were shown in full screen. The access to ones own images was made as fast as possible, yet still providing visible options to more complex features. Image browsing itself was made almost as fast as possible.

Finally, it is not unfathomable that some part of the pleasure comes from the interface itself. While it was unlikely that this would be the major driver for this system, various niceties were implemented to delight the user or at least make sure that the interface would not get into his way of browsing the images.

Examples of this are the transitions between the views and the persistence of images. For example, the main menu shows the latest taken or viewed image in the background with semi-transparent menus layered on top of it. Some browsing speed is sacrificed to make the images swipe in and off the screen, making the system more fluid. Images were zoomed to move between single images and image grids. Automatic screen rotation on devices that had accelerometers were also instances where the joy was combined with functionality.

3.6.8. Issues of Trust

Elemental aspect of making an acceptable system is to make it reasonably trust worthy. The need of trust depends naturally on the service itself, and, for example, the needs for banks are quite different from instant messengers. This becomes more understandable if we consider the nature of interaction people perform with these entities. Banks, as an example, deal with money and personal savings that have

direct and possibly dire consequences to people's lives if anything goes wrong. In the case of instant messengers, the biggest threats are about the usage with a possibility of eavesdropping. Major losses are likely to be related to finding a new service, as very little personal data is stored in instant messaging systems. Imaging services such as the one presented here lies somewhere in between. While it holds personal data that is potentially very private and certainly personal, the lost of data is not likely to be as devastating as losing ones bank account.

Costs are a factor in the current mobile ecosystem. As of this writing, the mobile data plans are not usually guaranteed to be sold together with the service contract. Furthermore, data is often charged by the amount of traffic, which leads to the urge to minimize the data traffic and its cost. As mentioned before, the design was based on the assumption of flat fee data plans and thus the system presented in this thesis provides minimal support for more fine grained monitoring of data traffic. Some corner cases are notable, however. While roaming, the application does stop from making data connections as roaming charges for data can be prohibiting. It is to be noted that this behaviour is by design, and thus efforts should be made to communicate the behaviour clearly to the new users. If this were omitted, the lack of trust to the system would be a real threat to the usage.

Another concern of trust comes from the automatic uploading of images to the service. eXposure tries to keep the users image collection in synchronization with the server at all times, by uploading all taken images to the users private account. It is understandable that the acceptance relies heavily on trust and that not all people will be willing to give their data to external parties. For example, such worries are quickly raised in companies whose employees take images to document their sketches from whiteboards. Again, this behaviour is by design, and needs to be communicated clearly to avoid lost of trust.

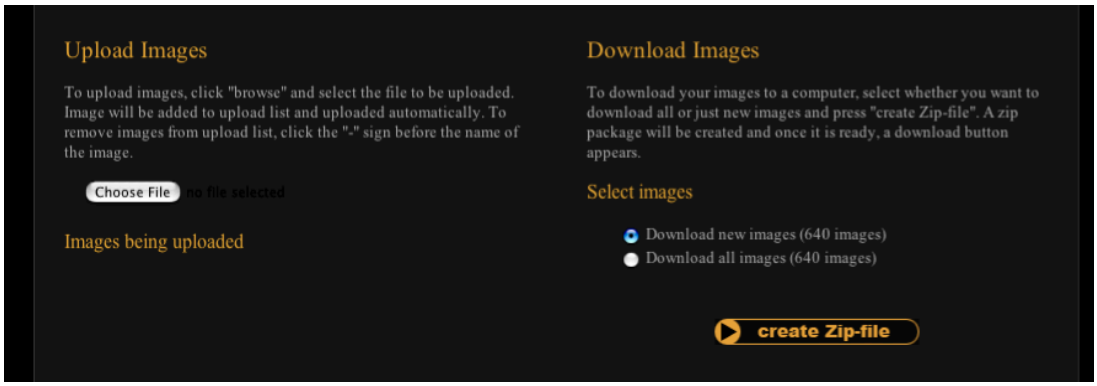

Figure 16. Image downloading and uploading options on the web user interface. Thus far not all planned features have been implemented, but the page serves to fill the assumed critical user needs nonetheless.

Being a research prototype also introduced an aspect that could not be downplayed – the imaging service was from the start planned to eventually go live and public. However, it was a prototype with limited resources, and could give no guarantees of existence for a long period of time. Even technical failures could be damaging to the service, which operated on relatively minor budget.

eXposure's two-way connection to personal computers was designed to allow both uploading and downloading images to and from the service. While the uploading itself was a crude means to allow people to have images from other sources than their mobile to be transferred to the service and to their hand sets, downloading was implemented to make it easy to get ones images from the service if the project would run into issues.

The web interface contains options to download all images belonging to the given user in a zip package or to limit the downloading to the images that have not yet been downloaded. These options were a balance of implementation effort, ethical demands as well as usability issues.

Some ethical issues were clear. It was simply not imaginable to not offer a way for the users to retrieve their images if the system was to be shut down. This was even more critical due to the technicalities that operated under the cover. Namely, the S60 client stored original images onto the web service and was only required to have scaled-down versions of the images on it for quick viewing. Were the service to go down, the originals could be lost for good. This was simply not acceptable from the team's ethical point of view.

On the other hand, the full implementation of the image packaging and downloading could easily lead to complex user interface that offered very little benefit for the user if all went well and was taxing compared to resources available. There was a need for a simple solution that would still guarantee safety. Furthermore, this solution should not be overly demanding for the servers that might have thousands of users.

Finally, the downloading system could not be taxing for the user if the need for it would arise, or if the users would start to use it for their own purposes.

The solution was to create a page that offered the users two options to create a zip package of the images they had on their user accounts. First, and the default, option was to only package and download images that they had not yet downloaded. Second option was to create a package of all the images. Last workaround allowed the users to simply save the images one-by-one while viewing them. Together these options were hoped to be sufficient for the users given the prevailing restrictions.

3.6.9. Compromises on Mobile Client

Preliminary designs and concepts are rarely perfect, as is the case with many other methods of formalization as well. For one, documentation is very rarely unambiguous. The reasons for these imperfections are many, but often the mere complexity of the project at hands is so vast that fully understanding it from all aspects becomes extremely difficult if not impossible. Thus it essentially comes down to the fact that people need to deal with imperfect plans for what ever they are doing. When, not if, surprises occur, compromises are often needed to adjust the plans to what is feasible.

As an example, the S60 client offered a menu entry "Latest" which allowed browsing the latest images in the service. While it would have been possible to do the updating in the background, quick calculations can be used to demonstrate the issues:

```
P = number of users in the system
I = number of published images, average per
user per time unit
T = total number of image transfers

T = (P * I)  * (P + 1)
```

This basically tells that the average number of images is sent to every person within the system. If we now imagine that the system has 10 000 users, each publishing an image per day, total number of transfers would be of scale:

```
T = 10 000 * 1 * (10 001) = 100 010 000
```

Being optimistic, 10 000 users is a pessimistic figure as the hopes for user count are much higher. Similarly, however, a published image per day per user is an optimistic estimate. Finally, the calculation did not take into account traffic generated by other activities. Due to this reason the estimation should be treated as an approximation that at best should give idea about scale but not exact figures. Nonetheless we can see that a simple functionality that would keep the public images up to date all the time soon starts to push technical boundaries. The number of image transfers grows exponentially with the user count, and with a mere user base of ten thousand the transfers would already hit one hundred million per day. One hundred thousand users would already result in ten billion image transfers per day.

In this light, the compromise of making the user wait for a brief moment while the newly published images were downloaded was a necessity. This was aided by the fact that Internet, for one, has taught people to wait. Further optimization was also done to make the wait time as short as

possible. The sizes of the downloaded images are reduced at the server end and they are downloaded in batches of multiple images to lessen the impact of network latency if they were to be transferred separately. As a result, a modern 3G mobile connection could theoretically be able to support downloading and viewing 15 images per second, albeit with the moderate hit on the wait time the user needs to tolerate at the beginning of the browsing session. In practice, though, such numbers are not likely to be reached in most situations and in others the delay can be even much longer. Finally, the already downloaded images were cached onto the phone to lessen the need of bandwidth and, much later on, make it possible to introduce off-line features such as access to vast image collection even when there is no network coverage at all.

Other discussed option was "virtually latest", where the images would not be required to be the absolute latest, but instead a collection that was update at specific intervals. This, however, could result in situations where new content would not be seen even if such were available. As one of the major functions of the application was identified to be killing time, this trade off was not acceptable.

In contrast, however, the dynamics do change when people are sharing images to their friends. The number of image transfers goes down dramatically approximately following the pattern below:

```
P = number of users in the system
F = average number of friends per user
I = number of published images, average per
user per time unit
T = total number of image transfers

T = (P * F)  * 1
```

Where as the last calculation showed exponential growth based on the number of users, this pattern is actually linear. Thus, for 10 000 users each having eight friends on average the number of image transfers is:

```
T = 10 000 * 8 * 1 = 80 000
```

This is obviously a lot less than a hundred million transactions mentioned in the previous example. Previous disclaimers to the formula apply to this one as well, but the growth of the transactions as user count increases becomes evident.

This made it feasible to share images, as well as the accompanying metadata, instantly to users friends as well as to receive new images automatically from these friends. While not yet implemented, the team needed to develop underlying technology for purposes such as this one. The exact technical functionality is out of the scope of this thesis, but in principle it allows the clients to retrieve images in a few seconds after

they are made available to the user and have the latest information from ones friends pre-loaded to allow immediate access.

3.7. On Visual Design

3.7.1. Relationship Between Visual Design and Interaction Design

This thesis separates interaction design from visual design only due to practical reasons, as it is easier to describe and justify decisions made on each separately. In practice, visual design was an important part of the sketching as it forced the focus on possible solutions. Without visual design, especially the mobile screens could easily become crowded or the planned information they would need to present might even be impossible to fit to the space they were given.

Furthermore, visual sketching motivated many of the interaction issues. Movement and layout could give affordances to the user to assist in describing how the system worked. Different ways to present information were also used to present additional information. Some visual elements were placed deliberately to be partially off the screen to show that the information flow continued to the given direction and that the user was able to navigate there. Axis on which information was laid also described the way how it was navigated – horizontal direction was always used to change context, or the image, to which operations happened and always reversible by an opposite action. Vertical direction was used to select options within the context and finally the depth was used to move deeper into the option structure if needed.

Movement added the dimensions to this layout. If an element appeared or disappeared, it could be cancelled or returned from with the cancel button, mapped to the left soft key. If movement occurred in vertical dimension, sideway keys were used for navigation and similarly the horizontal movement indicated up and down keys.

The mentioned issues are ultimately interaction issues between the software and the user, but the solutions rely heavily on visual design. Thus separating the two aspects would eventually be artificial.

3.7.2. Early Mock-ups for the Web

The early work on the design of eXposure started with a similar process that Bill Buxton describes in his later published book *Sketching User Experiences* (Buxton, 2007). At first, it was not important to come up with the exact designs of the service, but to study alternatives and sketch out ideas that were used to develop the concept further. Not only were these sketches used to study how the service would look and feel, but also what it was about. Essentially, sketching forced to think what was really important and what could be left for lesser attention.

This did not mean that the look and feel was of no importance. However, these important factors were subjected to change. Thusly the attention to these factors was emphasised only later on when it was clear what was wanted from the service in general. The beginning was in great many ways exploration of what was wanted and what was technologically feasible. In fact, visual design was used also as a brainstorming tool for features.

The following images give a few examples of the development of the web interface from early mock-ups to those that more present the current look of the service. Also included are some sketches of how the site should interact with the user.

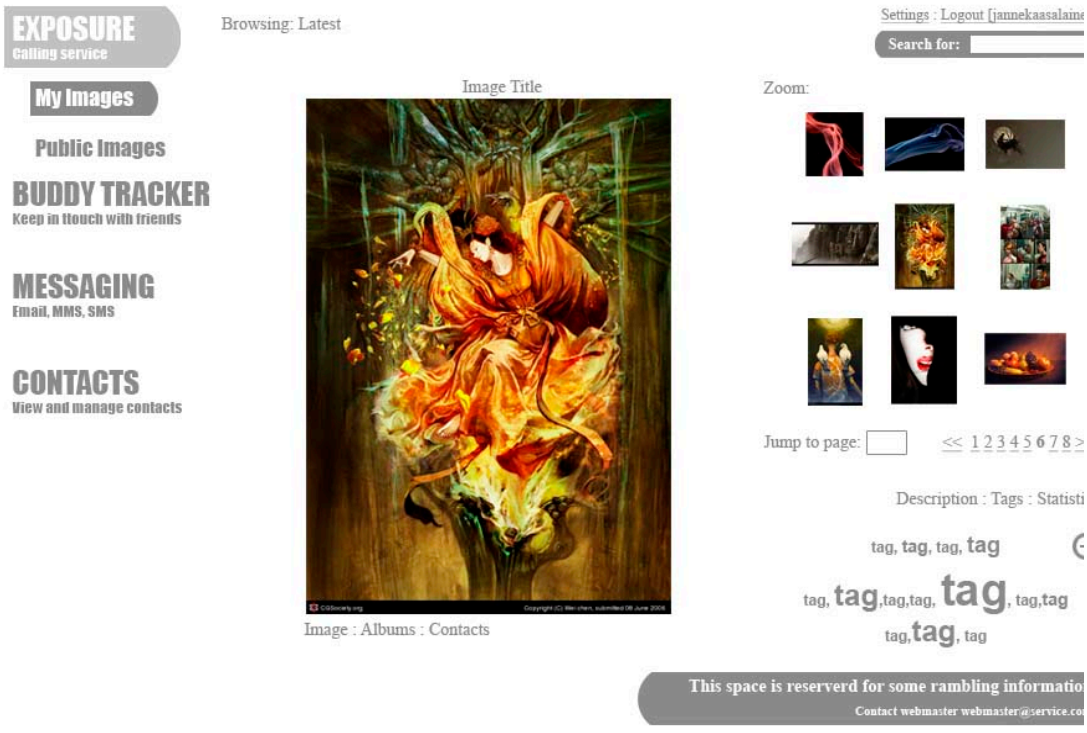

Figure 17. Sketches were produced with a white background before the black was fully established. The advantages of the

dark to increase contrast became evident from simple visual examples such as this.

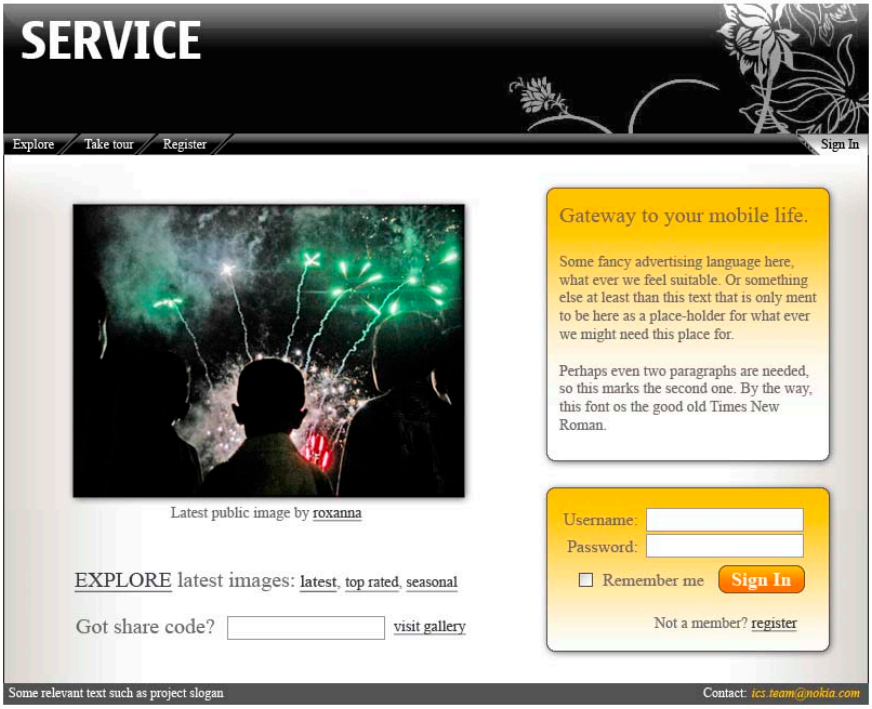

Figure 18. On of the details that never got to the prototype was the look and feel of the front page. It served as an exercise of style as well as to define the important elements and as a basis for conversation.

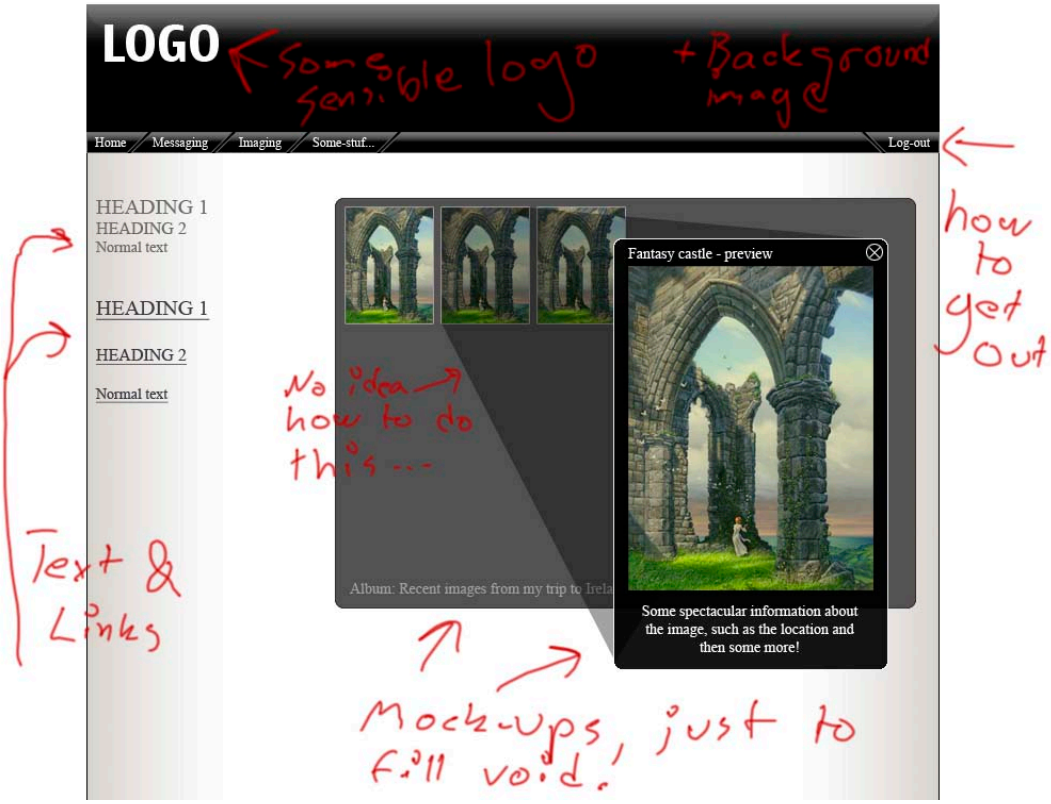

Figure 19. Basic interaction aspects were introduced gradually as more mock-ups were drawn. An image shows explanatory annotations on top of a sketch.

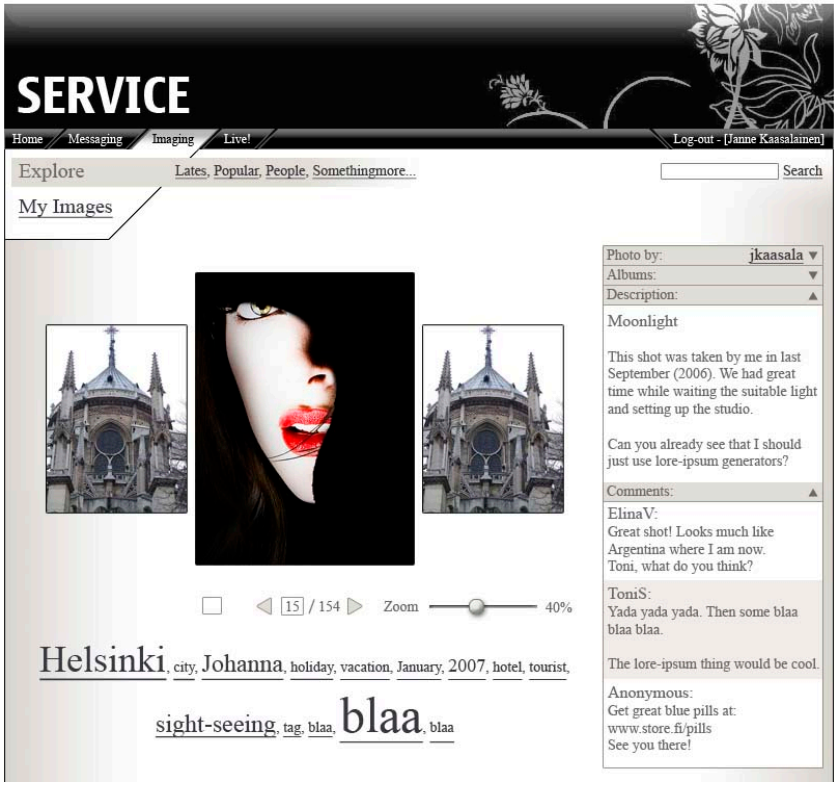

Figure 20. Eventually the mock-ups became more refined and the placements of various elements was experimented.

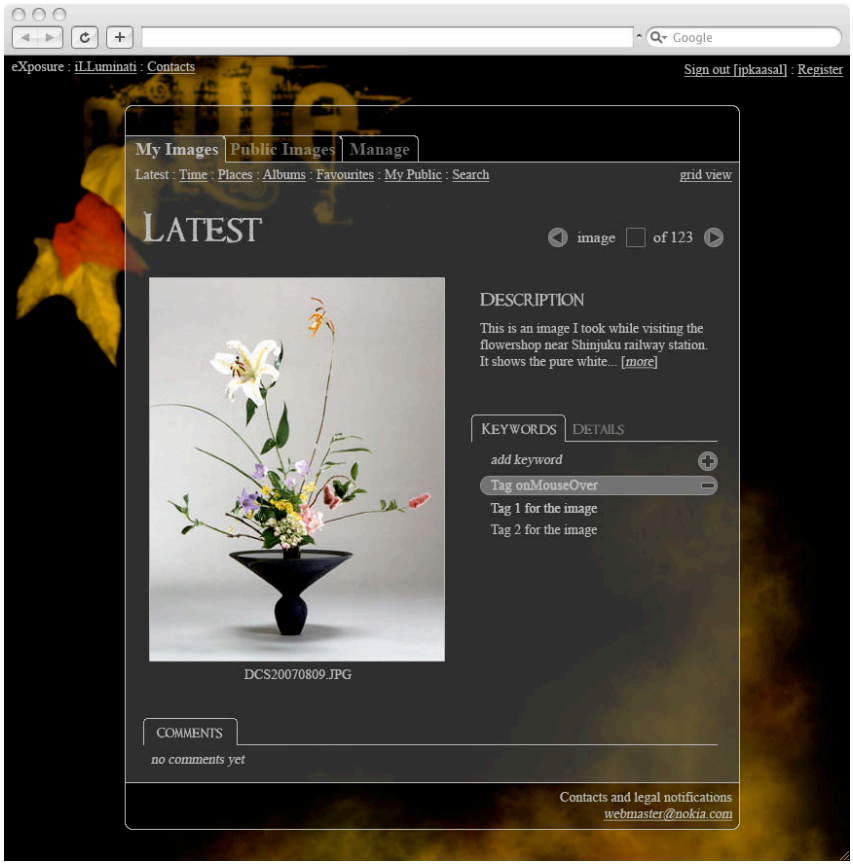

Figure 21. The layout was not the only thing that was experimented with. The style and the mood of the site varied from more artistic to invisible to serve as a basis for ideas and conversation.

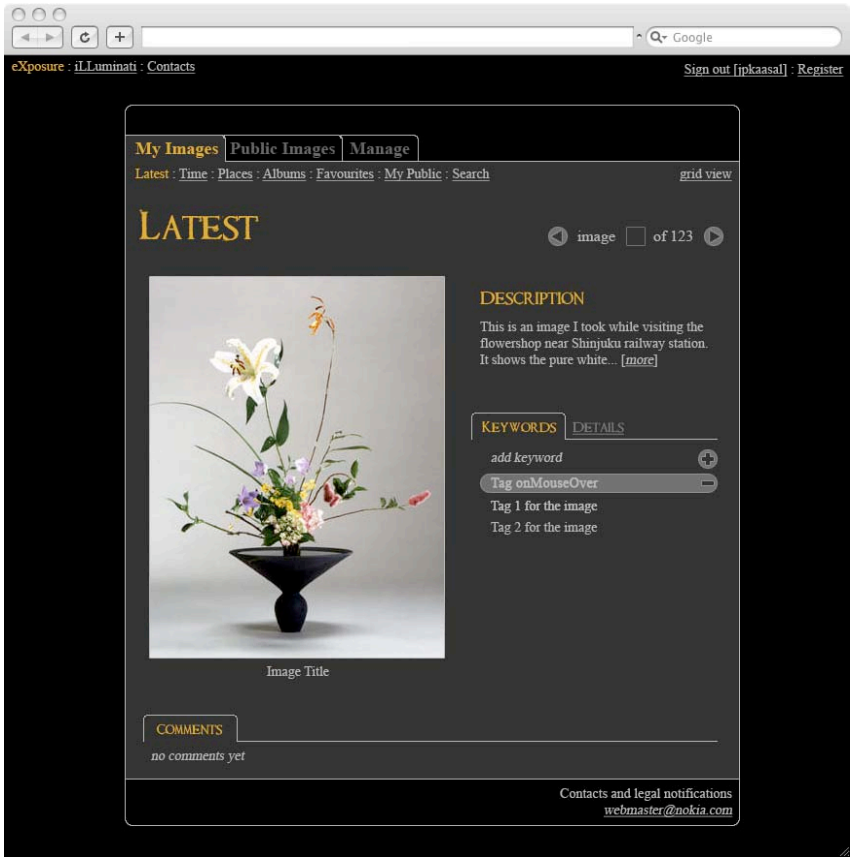

Figure 22. Eventually the chosen style was refined further and the distracting elements removed to concentrate on the essentials.

Rather soon it became clear that mysticism was an aspect that the team wanted to maintain, for several reasons. First, the project was a research project and thusly it was able to try out new ideas rather freely. Additionally, being a research project also meant that the looks of the application was to be changed in any case were it to be publicly launched and thusly it was in our interests to keep the look as reminder of the fact. This was partly so due to the fact that brand management had no part in the development as well as to visually differentiate with OVI.

The looks were nonetheless toned down from the early mood studies for technical, practical and internal marketing reasons. Web as a publishing platform limits the usage of fonts and some effects such as transparencies can be laborious to accomplish in browser independent fashion. While there would have been workarounds to many of these issues, if not all of the technical problems, it was also feared that having too biased style might alienate good part of the audience. These factors combined lead to the interface look and feel that eXposure has at the time of this writing.

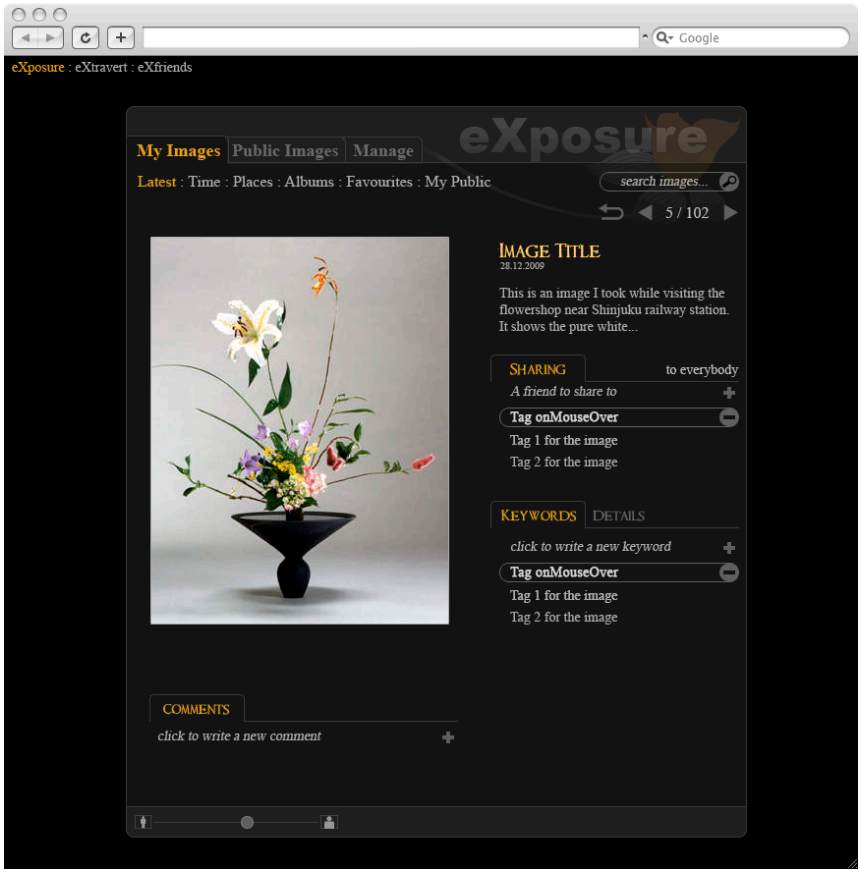

Figure 23. This example view for eXposure web service demonstrates the layout for planned functionality. Instead of presenting the exact visual outcome, the sketch tries to describe how the page will interact with the user.

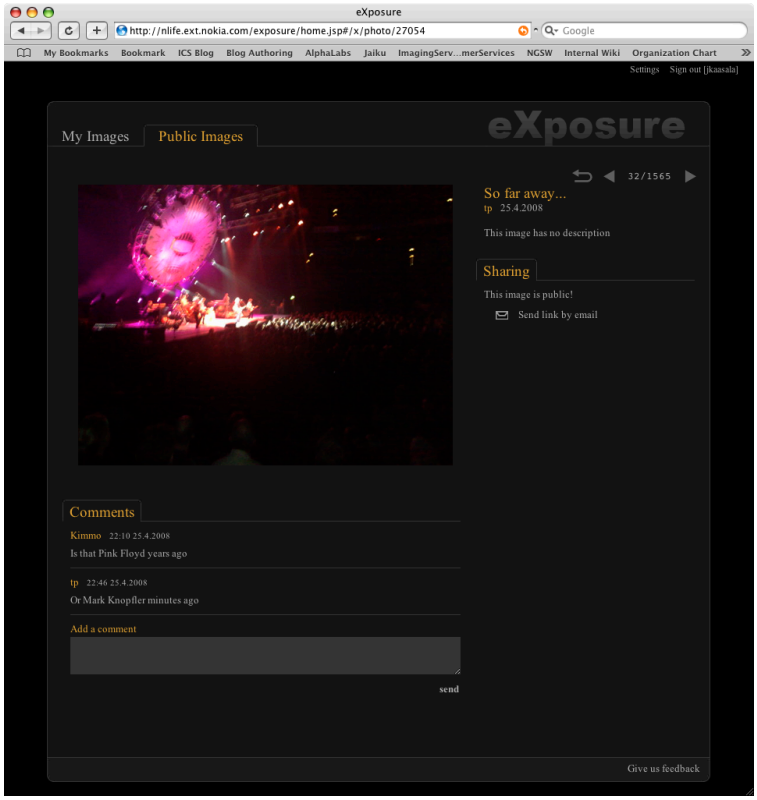

Figure 24. eXposure Web page on May 2nd, 2008. Much of the planned functionality is still missing, but the visual style matches the desired outcome somewhat closely.

There were also practical reasons for several of the visual design decisions. For one, the heavy use of black was used to emphasise the colour of the images as much as possible.

3.7.3. Mobile Interface

The mobile interface presented a set of its own challenges. Perhaps the greatest of these relates to the context in which the mobile phones are often used – mobility. The time in such situations is often fragmented and consists of small bursts of usage. Interruptions are also common. Thusly, the interface needs to pay special attention to these aspects.

In practice, this means responsiveness, to be able to utilize the time the user has efficiently. But further, it also means that there are limited chances to educate the user about the functionality of the software. This is especially the case in consumer space where no authority exists to force people to use the system.

The following images demonstrate some of the steps the interface design process went through while seeking simplicity and efficiency. It is also

crucial to consider that many solutions have a foundation in technology that was built to make the interface possible in the first place. Finally, in each step the system was considered as a whole instead of being separated into web and mobile portions. Thusly the different interfaces reflected the choices made in the other, which at times forced compromises.

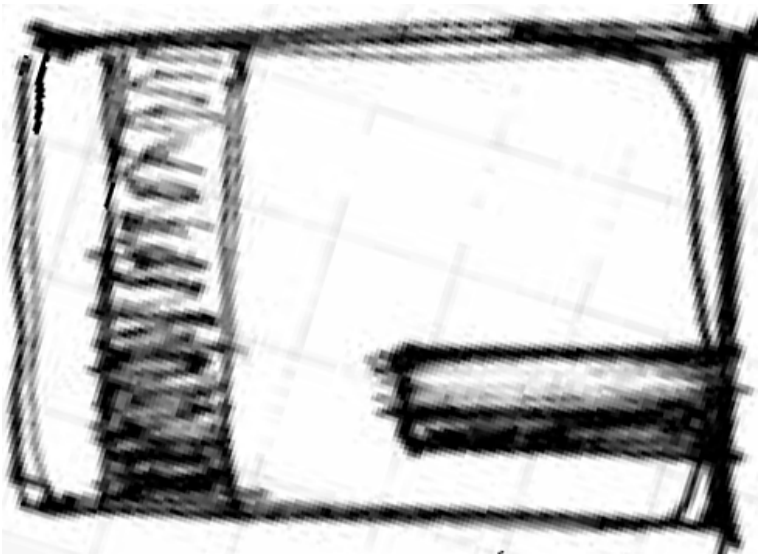

Figure 25. Not all of the sketches ended up in digital form. Many had their background in pencil mock-ups such as this one.

Figure 26. This particular attempt was discarded due to visual clutter and multiple concepts that were determined to be unnecessary at the main level of the application.

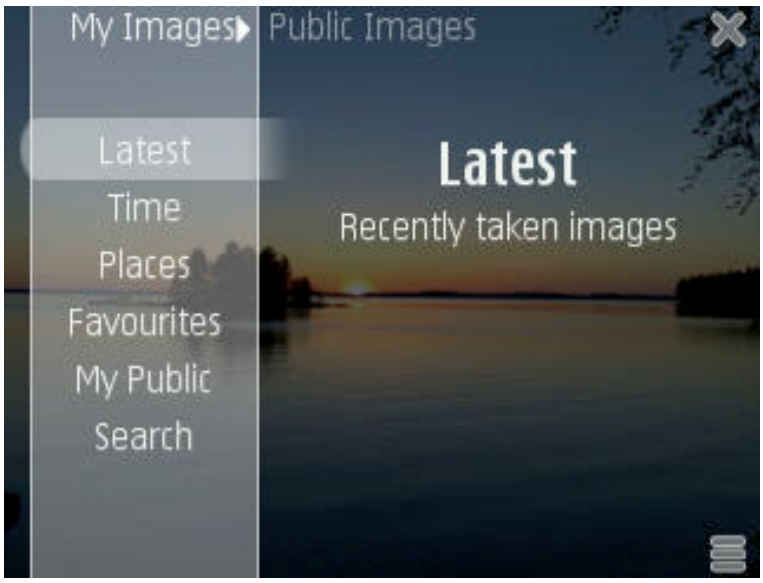

Figure 27. The eventual main menu for the imaging application. Elements that were not needed were taken off to avoid visual clutter on small screen. The latest image the user has taken is shown on the background via semi-transparent interface elements.

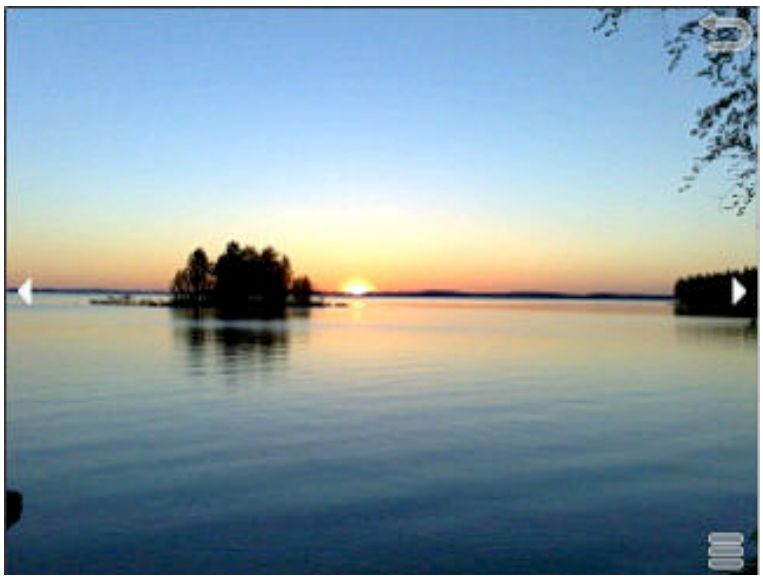

Figure 28. Strive for simplicity was a major design driver. This can be seen in the design of the image-browsing mode that shows only minimal interface elements besides the images. Arrows indicating possible browsing directions fade out after a second. Icons that remain are partially transparent.

4. Evaluation of the Imaging Client

"Interaction design (IxD) is the branch of user experience design that illuminates the relationship between people and the interactive products they use." – IxDA

An important part of the development of eXposure imaging service has been the role of user-centred design, even if it manifests itself in slightly unorthodox manner. The design was conducted in advance far before involving end users and their feedback, but that does not mean that their views were neglected. Instead, experts were used and scenarios were formed to account for the users realm.

There were no illusions that this view would be correct, however, and for those reasons the concept was, and still is, constantly evaluated. The following sections summarize the research being made to ensure its targeted audience will accept the concept.

4.1. Current User Behaviour, Spring 2007

The background research started by going through academic papers that described earlier studies on the field of imaging. These included aspect such as image organisation in both digital and analogue form, service design as well as studies about camera phone usage.

Based on background research, the team formulated personas and scenarios that described on high level how the envisioned system could help the users in their lives. It was rather easy to imagine various uses and features that could be provided. It soon became evident that it was essential to focus on the functionality that would have the highest impact. First reason for this was to ensure that the system would meet the users' expectations as well as possible whereas the second reason was more practical – having a sensible set of features to start with would allow faster iteration cycles with less implementation effort.

Nine interviews were held with participants that had expressed their interest towards imaging and had used web-based imaging services such as Flickr before. The users were highly technical and the gender distribution composed of 8 males and 1 female. Their ages varied between 28 and 50 which indicated that they were above the aimed target audience. Eight of them used a standalone camera and seven used mobile cameras actively.

Interviews were held in approximately 2-hour sessions, which consisted of gathering background information, going through the workflows that the users currently were using and finally asking them to evaluate the relevance of the presented scenarios. At the very end, a very high-level concept idea was presented and the users were asked to give free form feedback about its usefulness to them.

To rank the scenarios, the participants were asked to first read them through and then organize them in order of importance – the first being the most important and the last one being what they were least interested in. The results from this ordering are shown in figure 29.

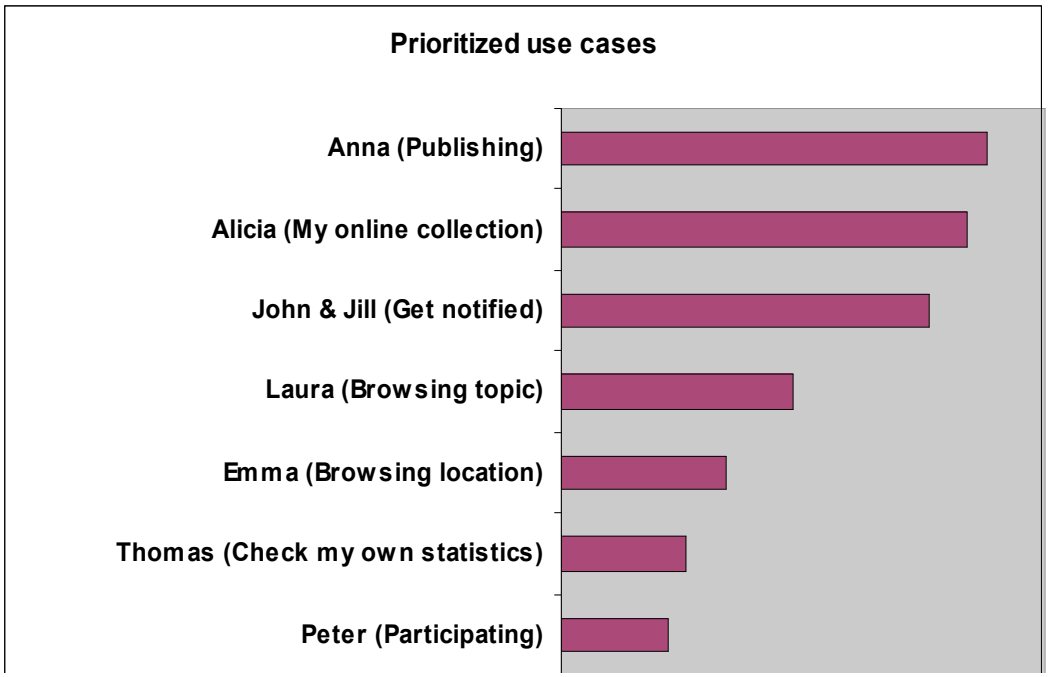

Figure 29. Priorities of the scenarios resulted from user feedback.

To gain further insight why the ordering was made, each participant was then asked to verbally explain why and what he thought about each individual scenario. They were also asked to give them a numerical rating between 1 and 5 regarding the importance of the scenario to them as well as to other people that they knew of. This was done to lessen the impact of interviewing only highly technical people. These results are shown below in figure 30.

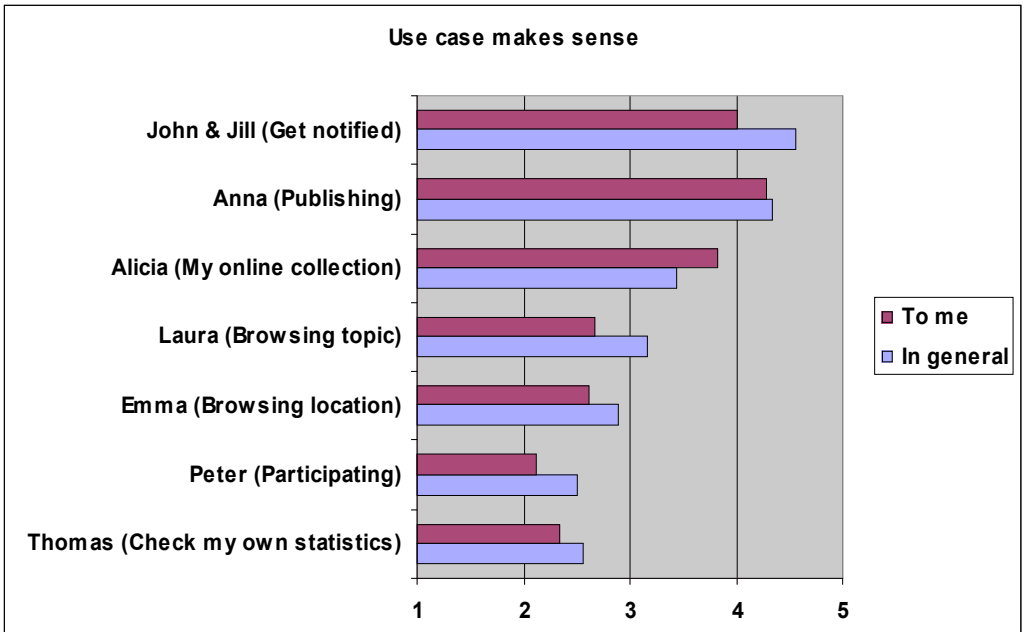

Figure 30. The lead-users were asked to rate how important they considered the scenarios to be for themselves as well as to other people they knew (friends and family).

In general, the most important images to the users where those that they had taken. After all, they were part of their memories. The study also highlighted the social nature of imaging – many of the pictures are eventually shared with the important people in the participant's lives. Further, since the images are so personal, there was a need to keep them safe.

The study also shed light into the workflows and practicalities that the users faced while taking the images and how they managed them. Considerable effort went to simply moving images around and organizing them. Some images needed to be managed early on, even on the camera. Technical issues also demanded know-how, such as dealing with limited storage space on digital devices. More information regarding the study is available via the ICHI'08 proceedings (Vartiainen, Kaasalainen, Strandell, 2008).

4.2. Expert Evaluations, Spring 2007

Expert evaluations were conducted rather quickly after ideation phase to ensure that the proposed interfaces would not cause fundamental problems that would be easy to avoid. For these reasons, the concept was shown to four experts of which three were usability specialists and the remaining one an art director. Two of them evaluated a Flash

implementation while the remaining two tried out the S60 Symbian version.

On general level, the application demo was found easy to use and understand. The purpose and function of the application was equally clear, but the terminology used in the demo needed refining. Some of the functionality was deemed unnecessary, such as offering the ability to view random published images. The terminology was also in need of refinement, both the actual terms and the consistency. Some of the terms were hard to understand (such as a proposed term "Shoots" which was meant to refer to automatic grouping of images based on the time they were taken) and in some cases different terms were used for the same functions.

Finally, some feedback messages caused confusion, such as the implications of allowing online usage and that enabling the function might generate costs to the user. These information messages were refined for later prototypes.

A major finding from these early tests was the general acceptance, which implicated that there were no large barriers stopping the implementation of the actual client. Would that have been the case at least a round of iteration would be needed.

4.3. Concept Evaluation, Summer 2008

While the expert evaluations did not indicate any immediate issues with the usability and the interface design itself, there is no guarantee of it being of use to the general audience. It could well be that the people would simply reject the whole idea or find different issues or uses for it. To gain better understanding of what people thought about the concept itself, a study was organized to introduce it to two focus groups in four different countries. The group interviews were then followed by individual interviews, hangouts, and on the following day participants were selected based on the group interviews.

Group	Location	Age	Social Network	Gender	Consumer Segments
Group 1	San Francisco	18 to 24	Mix of social network users	50/50 gender split	Early Adopters
Group 2		25 to 30			Mainstream
Group 3	Madrid	18 to 24			Mainstream
Group 4		25 to 30			Early Adopters
Group 5	Hong Kong	18 to 24			Early Adopters
Group 6		25 to 30			Mainstream
Group 7	Moscow	18 to 24			Mainstream
Group 8		25 to 30			Early Adopters

Figure 31. Statistics of the focus groups. Each group consisted of approximately eight persons.

The groups were not only separated by the geographic locations but also by their age and gender. Locations of the focus groups were distributed to give coverage of various cultures and to identify both similarities as well as differences in their preferences and usage habits. Due to these reasons a translator was needed in Madrid, Moscow and one the focus group interviews in Hong Kong.

The concept was not the only thing presented at each location. At San Francisco and Madrid it was introduced specifically only during the hangouts, whereas in Hong Kong the presentation happened during both the hangouts and the focus group meetings. In Moscow, the concept was shown in a focus group and during a hangout session.

As a conclusion, it was clear that the general idea behind the concept was not new – image galleries and web services do exist already and there are even uploading applications and synchronizers for various platforms already. However, the direct and transparent connection to online services was valued and noted to have a lot of potential. Important factor in this was the tight integration to existing applications to make the connection seamless.

Some concerns were raised as well, of which most notable were issues with costs. It was understood that pervasive network connections inflict possible costs to the users especially where data plans are not common. Thusly the need to have some control over the costs was expressed clearly. Further concerns dealt with the quality of the mobile camera itself and whether it was good enough for daily usage.

4.4. User Needs Study, Autumn 2007

The core ideas for the imaging service originated mainly from the teams internal brainstorming. These discussions were strongly affected by other existing solutions and papers from the academia. Personal backgrounds and experiences played great influence on the concept as well.

Despite having a concept in place, a user needs study was conducted in Tokyo during Autumn 2007. Japan was chosen due to its advanced mobile infrastructure and long traditions of using mobile solutions on mass-market level. This was further influenced by the high penetration of mobile phone cameras used as people's primary imaging devices. South Korea was considered as an alternative location but practicalities such as getting local assistance made Japan an easier destination. The intent of the study was to peek into the practices of advanced users of imaging services and those who had used mobile Internet for years. This was done to observe the difficulties people faced with the technology and for what these technologies were used in the first place.

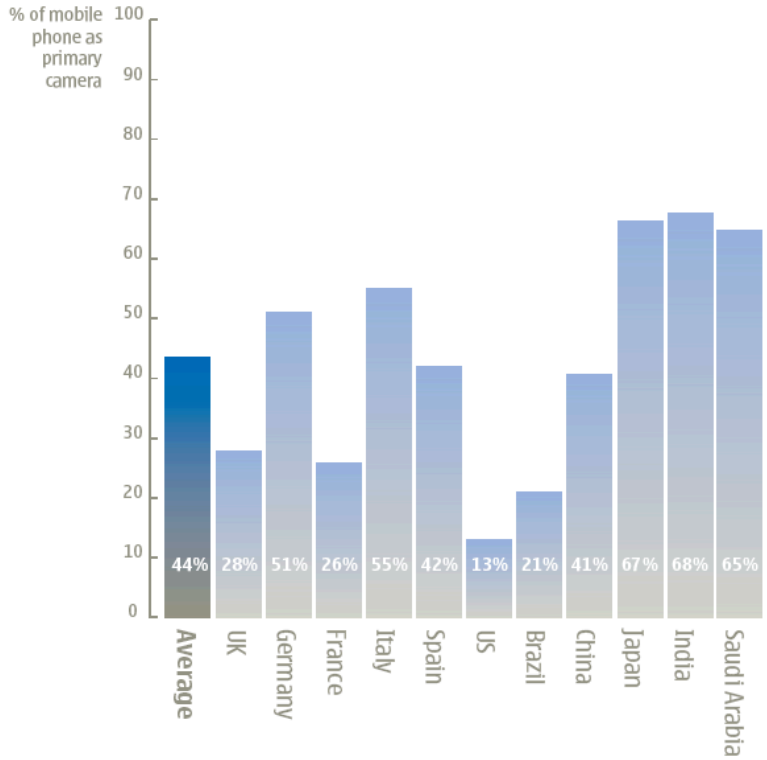

Figure 32. Japan ranks very high on mobile camera penetration. ICM Research, 2006.

Trials took place between October 2nd - 7th and consisted of contextual inquiries. Seven locals were interviewed with a help of a simultaneous translator in their homes and an additional one at an office due to travelling arrangements. The interviews lasted approximately two hours

each. During these interviews we gathered background information, asked about their daily life and how they utilize imaging related Internet services. Additionally, they were encouraged to show how the images they had taken ended up in their final destinations such as blogs.

Eight interviews were held altogether. From the eight participants 5 were female and the ages varied between 21 and 38 years of age. Most of the participants were students or employed but the range of professions also included a housewife. They all used mobile devices as their primary cameras and all used imaging related web services in one way or another. Six had also other cameras and six participants paid their bills themselves. Two participants had their costs covered by either a husband or their parents. All of the participants were from Tokyo metropolitan area.

Contextual interviews are very specific and generate a large amount of data. However, the scope is typically somewhat limited. For example, eight interviews cannot be considered statistically relevant for a population of 130 million. This affects what kind of results can be drawn from the gathered information. The selection of the users also needs to be carefully considered. In this instance, this was left to a local design research firm.

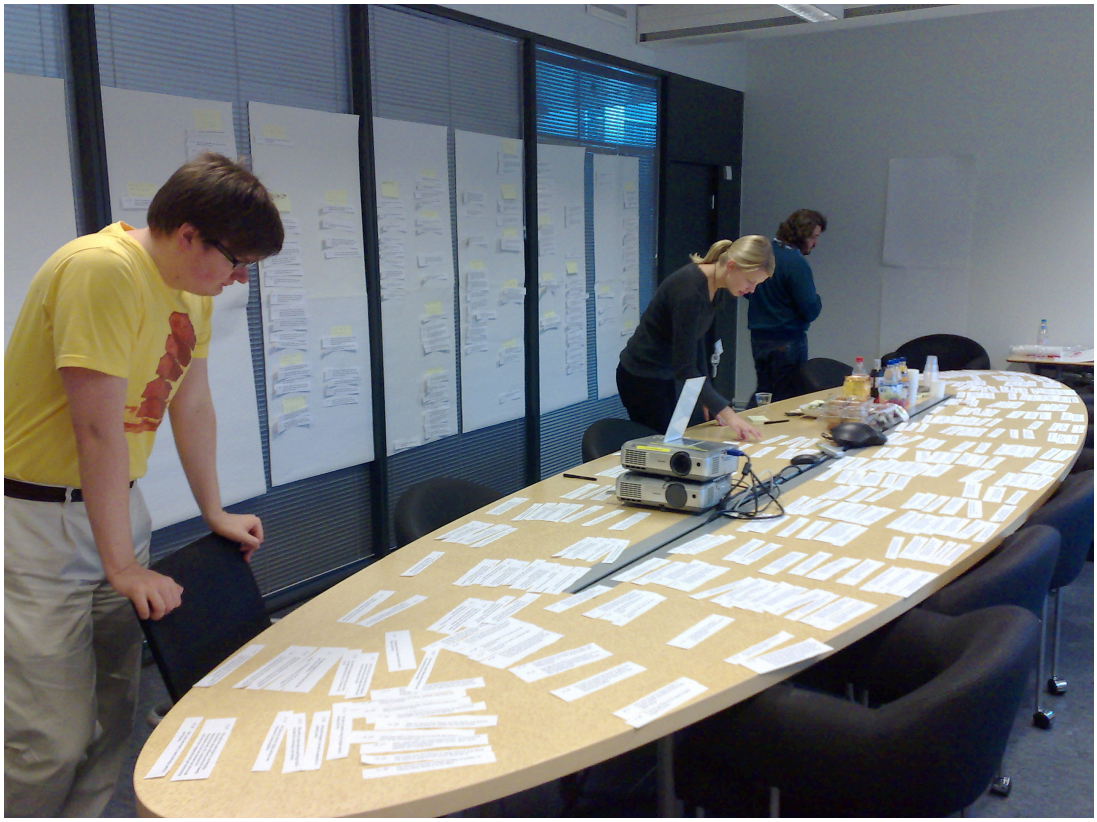

Figure 33. Data gained from contextual inquiry was vast. Team used several days to organize it to an affinity wall to draw conclusion and find emerging trends.

The main findings were that the images are often used to support story telling and emotional sharing either directly or indirectly. An image can be utilized in a log with accompanying text to make a direct explanation of what the person has experienced, but can also be sent to known people to create discussions on the next meet up. Furthermore, these images are most often about daily life.

Study also reinforced the previous hypotheses that the service should be hassle free and that many users face issues transferring images from a device to another. A participant had even resorted to using old mobile phones as albums and simply kept her pictures permanently in different phones.

Finally, the importance of restricted sharing also came up. The participants are very careful about how the images made them look in the eyes of others. They were also very careful about who to share their photos with in the first place. A clear need for targeted sharing was thus noticed.

In general, the study indicated that the concept prototype addressed many of the issues already. The feedback did indicate, however, that certain aspects and priorities should be reconsidered. Most notably of these was the difference in how the images are shared. The importance of the people already familiar to users became more evident. Furthermore, privacy issues were to be revisited to make sure they would not cause issues later on.

4.5. Alpha-User Feedback, Spring 2008

The alpha release of the imaging service occurred very late 2007 and was targeted to technical audience and enthusiasts. The release was internally available to all who'd wish to participate, but did require some effort to be taken into use. At first these issues included the need of explicit request of software certificates that were needed due to device DRM (Digital Rights Management). After a couple of months, a web-based survey was sent to the active users to gather their opinions and feedback for further development.

We divided the survey into three parts. First one tried to gather background information about the respondents to better understand their needs and opinions and how those would correlate with the target audience of the service. The second part dealt with their experiences with the service and the last part gathered opinions about possible future directions the concept might take.

The questionnaire received 21 responses. Out of these answers, 20 came from males and all were users of the service or at least had used it. Furthermore, the participants were all outside the development team.

Similar patterns started to emerge regarding the habits of taking images. Mobile cameras were mostly used on sudden, everyday events whereas "real" cameras dominated in situations where the participant was expecting to need a camera and thus wanted to prepare for the event. Perhaps due to the technical background of the audience, many participants also had other cameras besides their mobile phones. Further evidence also indicates a polarization among the participants based on the frequency they took pictures. 16 out of 21 participants took images at least a few times a week. The participants were also rather active users of image sharing sites and services.

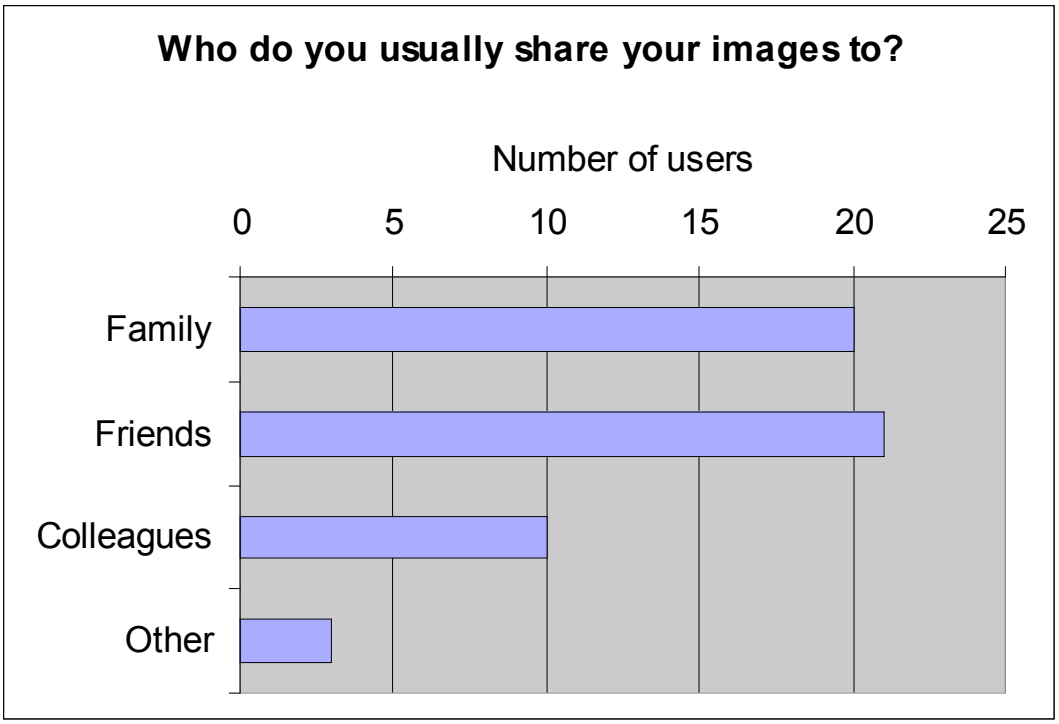

Figure 34. The importance of friends and family was once again highlighted.

The previously observed sharing patterns appeared in the Japan study as well. The importance of friends and family far out-weighted the desire to share their images publicly – even if this was at times a by-product of being able to share to those that the participants wanted. This was particularly evident regarding web-services that required a user account to restrict sharing. If the recipients were not expected to have such an account, publicly available or emailed images were used instead.

The users' experiences with the prototype service were impacted by the instability of the prototype and the limited availability of the service. At the time of testing it was impossible to let friends to access the web service or install the mobile client. Thus, the motivation to share images or use the service was low. On the other hand, the ease of use and the design solutions were found attractive and received compliments. The best things the service offered were automatic management and synchronization of the images and associated metadata, simplicity and speed of the implementation on the mobile. The following is a list some of the positive comments from the participants:

> *"The whole concept of how the application is used is very attracting"*
>
> *"The UI concentrates on photos, all phone stuff is background"*
>
> *"Convenient", "Intuitive and clean", "Slick ", "Clean and modern"*
>
> *"It post all your images privately"*

The worst things the participants reported dealt with outside integration which was minimal at best. Users would have wanted to see connections to Flickr, VOX or other similar services. The service was also criticised for not working as an image hub between the mobile and the PC as the web-based interface did not allow uploading images from other sources such as digital cameras. Some of the comments about the negative sides included these:

> *"No outside connector to other web services (Flicker, VOX, others), this would allow one to use the service one wants."*
>
> *"Not possible to share with all my friend and relatives"*
>
> *"The services might be closed some day and all my work gone with the wind"*
>
> *"Does not integrate to MMS"*

The later revisions of the service addressed many of these issues. MMS integration was implemented and the web service was expanded to allow one to back up his images in a zip file either incrementally or as a single package. Further, as it was again noted that email played important role in image sharing, the web interface offered a direct link to send the image to person outside the system and thus allowing friends and family to participate. Allowing outsiders to discuss with each other in the image comments anonymously was also hoped to encourage participation.

4.6. Concept Evaluation on Field Trials, Spring 2008

As the prototype matured and the implementation became more robust, it became feasible to test it outside the controlled environments and with less technology savvy users. This was considered highly important even despite the fact that previous studies had both verified assumptions about what the system should do as well as given hints about the concept acceptance.

Two friend groups were recruited, each consisting of five participants. The groups were given suitable test devices and the costs of their communication needs were paid to simulate an ecosystem where Internet connections were pervasive. The test was set to last two weeks, but due to Easter holidays the participants were allowed to continue their usage for a week longer if they so wished.

Half of the participants were pharmacy students from University of Helsinki whereas the remaining half were students from Helsinki School of Economics. In general they had no technical background, but some had keen interest towards technology and even considerable technical skills. Their ages varied between 19 to 25 years with an average being 22.3 years and a median of 23. Two out of ten participants were females, which skewed the demography somewhat. It was considered more important to have friend groups than to have exactly even gender split. For the study none of the students were previous users of Share Online or Flickr. In fact, a few didn't even know what Flickr is.

The groups were set to test and compare two applications, the prototype and a combination of Share Online and Flickr. Share Online was chosen as it presented the current state of the art even if it may not be the best possible existing solution. It was, however, a public solution that could be used by any user with suitable phone and did mostly the same things as eXposure. In fact, Share Online was a much more feature rich product allowing, for example, sharing images just to specific people and having notifications about new activity. The participants were asked to ignore the features that didn't exist in both applications, but it turned out this was not eventually the case. Finally, a comparison with Share Online allowed the participants to use the same device for both systems, minimizing the external influences to their opinions and concentrating only on software differences.

The applications were tested sequentially. The first group started with Share Online and switched to using eXposure after a week. The second group started with eXposure and changed to Share Online. This was done to average out the preferences the first introduced system creates. We

have observed that the expressions and comfort from knowing the initial system is very hard to overcome. Thus the latter system is always put into disadvantage.

The test was run as an iteration cycle between March and-April 2008. The status of the prototype was not feature complete and it suffered from various known issues. Some missing features were effectively simulated due to the restricted nature of the prototype. For example, sharing with friends became feasible via simply making images public as there were not many other people using the system and thus the public image stream was not saturated with images coming from random people. While this gave the opportunity to peek into the differences between publishing images to everybody and sharing between a closed group of friends, it also gave a slightly too rosy picture about the easiness of the sharing. However, this fact seems to have little impact to the core results of the test but it does need to be tested again with a later version of the client.

During the test weeks the participants were given tasks to perform within the next 24 hours. These tasks were made to ensure that they used the applications and that the usage covered the areas that were of interest for the development work. The initial task was to take the application into use. Some other tasks concentrated more on image publishing. As a feedback, we asked them to reply how hard the tasks were on 5-point Likert scale – 1 meaning very hard and 5 very easy. An example of task is given below:

> *"Discuss about images and add comments to images that other users of the service have published. Please do these both on your mobile device and on a PC.*
>
> *a) How easy was it to comment images on a mobile device? 1=Very hard ... 5=Very easy*
>
> *b) How easy was it to comment images on a PC? 1=Very hard … 5=Very easy"*

The question topics are listed in figure 35 for both compared applications together with the standard deviation. Interestingly, on average eXposure was found to be easier to use in each individual task. Largest differences were in taking the application to use and in the browsing of public images. It should be noted that taking an application to use is perhaps the most crucial aspect given that no other usage is possible unless it is accomplished first.

Another aspect to note is that the score differences in most tasks are not overly large, and indicate an evolutionary improvement over a previous system instead of a big improvement.

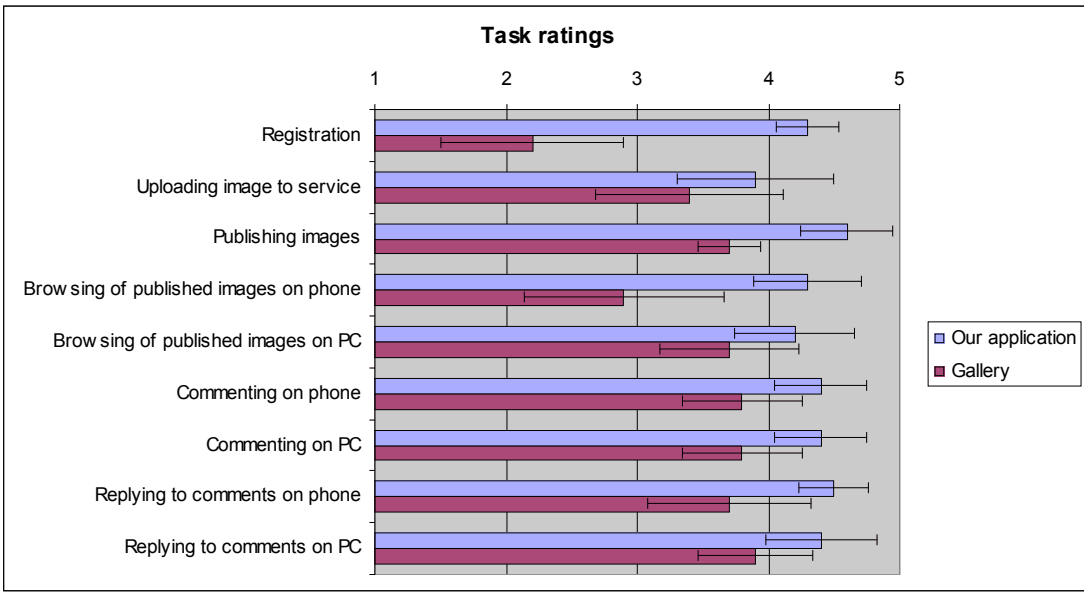

Figure 35. Results of the ease of use evaluation. The prototype scores consistently higher than the comparison, but in most cases the difference is not very large.

As an interesting and surprising element, the web-based interface faired well against Flickr, which has undoubtedly used far more resources to develop their service. This is even more of a surprise given that the eXposure web interface did not receive equal amount of attention compared to its mobile part. In fact, it was expected that Flickr would have lead in the tasks that utilized the browsers as interface.

After each week of using the applications, the participants were asked to fill a web questionnaire that tried to gather their opinions about the various aspects of the systems being used. The same 5-point Likert-scale was used again, together open-ended questions and comment fields. Collected data is shown in figure 36 below.

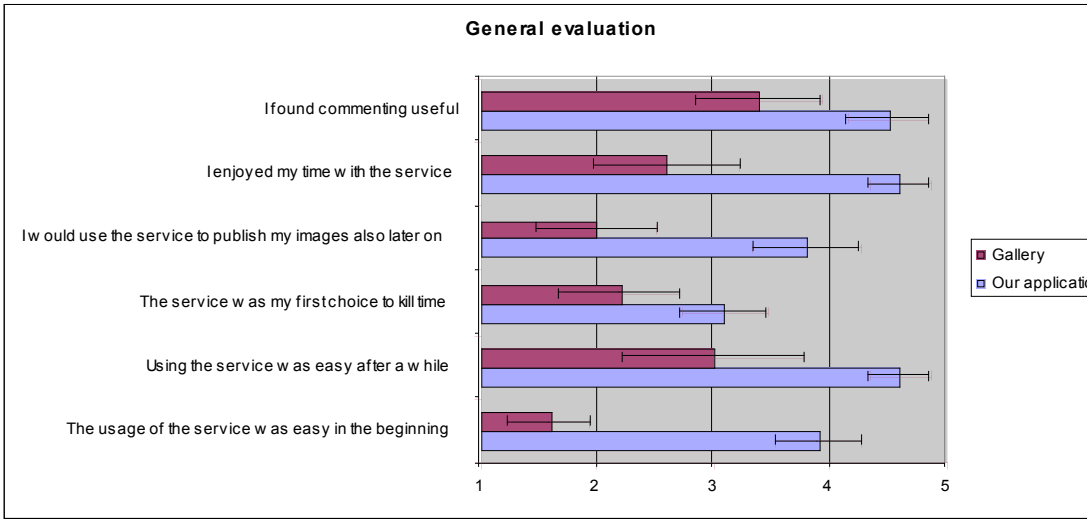

Figure 36. To gain insight about how our prototype fits to the participants needs, a set of questions were asked. These tried to paint a view of the high level impressions and what part the applications played in the participants' life.

The general evaluation shows differences between the systems. First, the differences between the two appear larger, and secondly, the broader questions dealing with enjoyment and prolonged use start to stand out.

The evaluation questionnaire contained questions that try to answer specifically how the users experienced the system and which parts of it were more pronounced than others. This set of questions was based on Mark Hassenzahl's work on pleasure, appeal and hedonic qualities of user experience (Hassenzahl 2001, 2003). The questions and the average scores for each application are shown in the figure 37.

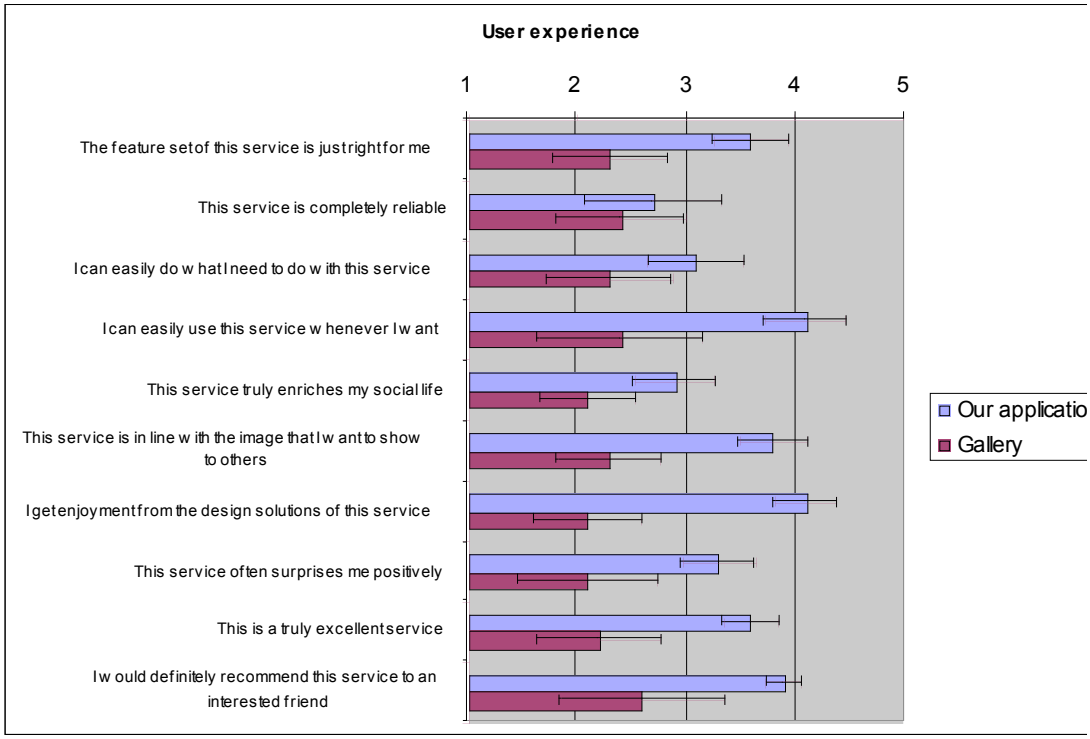

Figure 37. The attempt to measure user experience and more emotional aspects resulted in clear separation between the applications. The graph represents the averages based on the answers of both test groups.

Unlike the usability specific questions, the data shows substantial improvements over Share Online. Combined with the questions regarding the general aspects of the services, there is a strong indication that the ease-of-use does not correspond completely with the aspects how systems feel to use, e.g. the actual user experience.

Besides collecting the feedback from the users, usage data was also observed. We counted the public activity in regards to comments and published images. Due to restrictions by Flickr it was impossible to collect personal data of the exact number of image uploads that were not published. The data collection was done to see if participant's feedback correlated with their actual usage. The resulting data is collected in Figure 38 and compared between the tested systems.

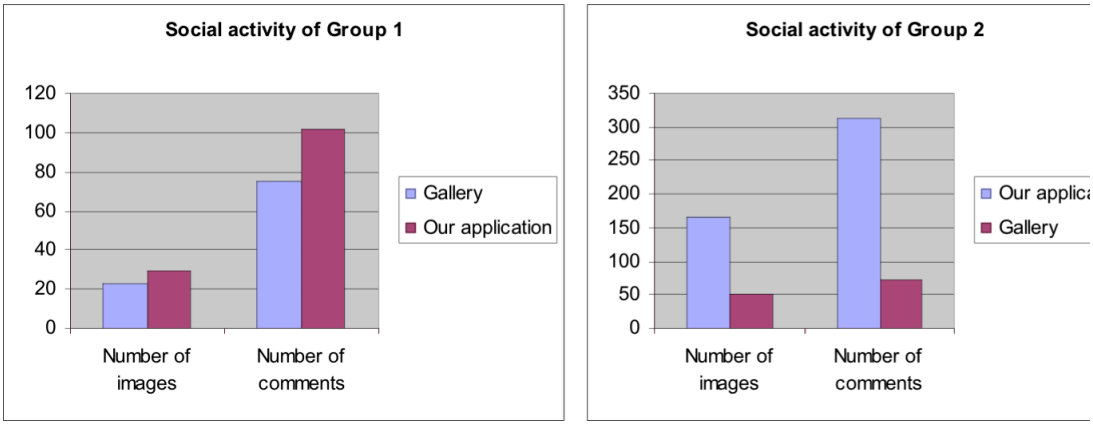

Figure 38. Changes in user activity based on which application they were using. Activity of the group that started with Share Online increased once they switched to eXposure. Similarily, activity of the group that took Share Online into use declined.

As can be seen from the figures, the system that the participants preferred was also used more, no matter if it was the first or the second one tested. Those who started with eXposure practically gave up with Share Online as their usage of eXposure was 325% higher when it came to images and 420% higher with commenting. The groups that started with Share Online published 26% more images with eXposure and number of comments increased 36%. The quantitative data thusly supports the questionnaire results and impressions from the interviews that were held at the end of the field test period. Combined with the observations that the enthusiasm often drops after the first week of usage, these numbers appear even more interesting as group 1 acts against this premise when using eXposure.

Finally, the participants were also asked directly which application they would choose if they were free to do so. Together with the decision, we also asked for confidence of their choice varying from “no preference” to “strong preference.” Results are listed in figure 39.

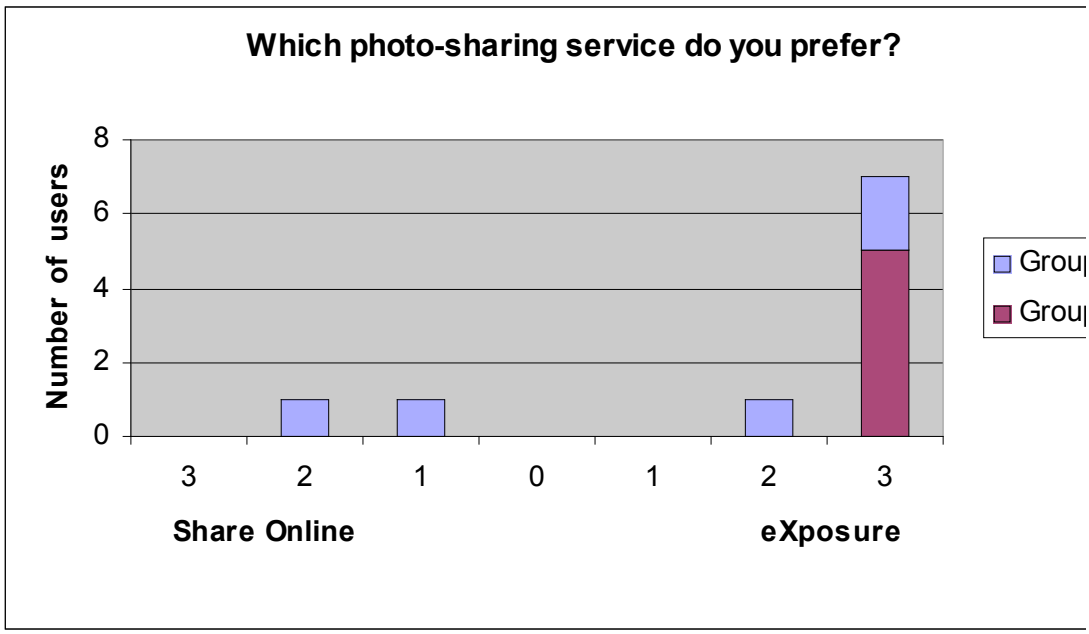

Figure 39. Preferences of test participants. eXposure was preferred by eight out of ten participants and the confidence level towards it was much higher than with Share Online (0=no preference, 1=Slight preference, 3= strong preference).

The interviews conducted explained the division somewhat. It turned out that Share Online had some features that were simply not possible to do with the prototype application at the given time. A participant listed this as her only reason to choose Share Online over the prototype. Nonetheless, eight out of ten users chose the prototype as their preferred application and the confidence in this selection was mostly very high.

Several pain-points were also identified for the development of eXposure imaging service. More organization options were hoped for as well as restricted sharing so that only one's friends could see the shared images. Image searches were also found to be lacking. Multiple implementation related matters came up as well as issues that related to the actual phone itself. Perhaps most importantly, many of these issues were the same as the ones identified in the previous studies. This reinforces the justification to target the features that seem most common between various users.

As a final disclaimer, it should be highlighted that the field test itself was a small-scale test. It consisted of a small number (10) of participants with rather similar cultural backgrounds. While they were close to the assumed target audience, the results cannot be generalized to larger markets. Further, due to the small number of users some of the findings are statistically questionable. That said, the results give indications of what might be expected from the system later on.

4.7. Overview

The previous sections have described the user tests and their main findings during various iterations of the eXposure imaging service. Tests used various methodologies and aimed to provide for vastly different kinds of results depending on the projects needs during those particular moments from early concepting to a decently well working prototype.

While the sections above do not try to explain detailed relationship to the design process, it is to be emphasised that many choices made in design were result of these findings. Perhaps most important of these was the initial feature set from which the concept was expanded and defined the most crucial features. Later on the social aspects started to gain importance and the direction was modified where suitable to meet the demands such as being able to easily share and show images with ones close friends or family.

Further, given the needed development time and effort, it is highly beneficial to evaluate the concept and proposals as early on as possible while keeping in mind that the results may not totally reflect the feedback the envisioned system might get. Had it been shown that the concept was disliked, more iteration would have been made in the early phases of the project.

Finally, the progressive evaluations allowed us to get feedback on design decision made early on in the project for both future learning as well as guiding this particular project to meet arising challenges. The studies culminated in the field tests that represented the aimed audience relatively closely, even if on small scale.

While none of the tests were exhaustive, they did build on each other and give indications of what kind of results are likely to be obtained from the eventual system. They also go to show that there is a correlation between the areas on which most effort was spent and the areas that the users appreciated highest. The studies have also shown that experience design can help to achieve better user satisfaction. It remains questionable if the design philosophy described in this thesis on itself is a successful one. Further projects are needed to test whether the same principles can be successfully used to create other pleasant-to-use systems.

5. Conclusion

"We should work for simple, good, undecorated things" and he continues, "but things which are in harmony with the human being and organically suited to the little man in the street." – Alvar Aalto, speech in London 1957.

This thesis has described the design process for an imaging service called eXposure. Some of the principles from my previous works seemed to produce positive experiences yet again when applied to this case. Speed and responsiveness of the interface was yet again rated highly in user feedback results. The aim for simplicity in the design language, the presented information itself and in the system behaviour was found to be pleasant. Further, the concentration on both the user content and the users intent seemed to be appreciated.

Perhaps most importantly, the elements that were found working for eXposure imaging-service had also been present in previous work, albeit in more scattered form. This gives reasons to the belief that the basic principles at least can be used to create pleasurable user experiences even if they are not likely, by any means, to guarantee positive results.

Finally, in answering the research questions it seems that experiences can be designed for to a certain extent and to targeted groups of people. While the results obtained from the user tests are inconclusive, trends seem to surface. Combined with the design drivers, we also see correlation on user feedback and aims set for the service. Still, the design

did not work totally as planned. The usage scenarios were far from what was imagined and the focus of the application shifted among the target audience giving much more emphasis on social aspects than the personal ones. To encapsulate, it seems that trying to design for experiences improves the chances of succeeding, even if the actual usage differs from what was imagined.

However, many issues remain with the current prototype implementation. For one, it is obvious that the current sharing system will not scale if the service gains any larger number of users. Secondly, the current version only works on relatively small set of suitable mobile phones and practically requires a flat fee connection. These limitations, among others, are still being worked on and hopefully improved upon relatively soon.

Further development of eXposure continues, and the service will possibly be offered as a public beta to gain more opinions and comments from interested users. If this were to happen, the team would undoubtedly learn more of what constitutes creating the said user experiences and how global aspects affect design processes and assumptions. Some of the open social questions can unfortunately only be answered by trying them out in public.

6. References

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7. List of Figures

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